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FORESTRY ABSTRACTS

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THE KILLING OF "WEED" TREES

IN various silvicultural and land-clearing operations there frequently arises the problem of eliminating undesirable "weed" trees that are of little or no economic value. The best method of doing this will vary with the species and size of tree and with the purpose in view. It is not only a matter of making sure of the ultimate death of the tree. The speed at which the tree dies, the vigour of sprout production, and the effect of the operation on neighbouring trees and on regeneration may all have an important bearing on the success of the treatment.

While felling is the method most commonly used it has a number of disadvantages, and is recommended only for the removal of small trees (up to 5 in. d.b.h.) of species that do not sprout readily. In large-scale operations felling is time-consuming and costly and may result in excessive damage and too sudden and extensive exposure of young growth. These disadvantages become more pronounced as the size of the trees to be felled increases. Furthermore, the felling of hardwoods usually results in a heavy production of sprouts or suckers, particularly from the stumps of young, vigorously growing trees. In order to reduce sprouting, felling should be done in the middle of the summer just after the period of greatest activity and when there is relatively little food stored in the roots and when the usual conditions of high temperature and low moisture reduce their vitality [25].

Partial cutting and bending of a tree, or lopping the top, are two variations that have been used to some extent for eliminating crown competition and checking sprout development, but neither of these methods is easily applied to large trees and they both have certain other disadvantages [13].

Burning has been investigated as a possible method of killing thin-barked species such as Western Hemlock (*Tsuga heterophylla*) and Grand Fir (*Abies grandis*), and is particularly useful in opening the canopy and destroying the seed of unwanted species. However, broadcast burning will usually result also in the destruction of the seed and seed trees of more desirable species [10].

GIRDLING.

Girdling is a method that has long been used for killing unwanted trees and has come to be recognized as an effective and economic method of carrying out improvement operations in certain forest types [1, 7, 12, 13, 15, 16, 17, 34, 38, 41, 42] and also of checking sprouting in some hardwood species [35].

The immediate object of girdling is to interrupt the sap movement and thus prevent the water and mineral-salt solutions flowing from the roots to the leaves and the elaborated food materials moving down from the leaves to the roots.* If properly done, girdling will usually result in the complete killing of the tree within a period of five years, the time required depending mainly on the species and size of tree. However, even when girdling is complete some species can survive for a considerable time; cases have been reported of relatively small conifers living and growing for periods up to 13 or 14 years after girdling [21]. Survival, whether for a short or long period, is made possible by the tree (*a*) forming a callus across the girdle, (*b*) making use of materials stored in the rays and parenchyma cells of the woody tissue of the stem below the girdle, (*c*) obtaining supplies through root grafts from neighbouring trees of the same species, or (*d*) producing stool shoots or adventitious buds below the girdle [14, 19, 37].

The following are the methods of girdling most commonly used:—(*a*) a ring of single, overlapping, downward slanting hacks, made with an axe, known as hacking, frilling, or ring-girdling; (*b*) two such rings 2–6 in. apart resulting in the removal of the chips, known as double-hacking or chip-girdling; (*c*) the formation of a V-shaped notch by making both downward and upward slanting strokes with an axe, known as notch-girdling; (*d*) removal of a band of bark 6 in. to 2 or 3 ft. wide from the circumference of the tree, known as peeling or banding [13].† The use of a $\frac{1}{16}$-in. hack saw to make one cut through the bark and sapwood has been reported as a successful method of girdling Teak in Burma [14].

The effectiveness and relative cost of any method will vary with the species and size of tree and with the efficiency of labour employed. While a shallow girdle is more effective than a deep one in checking sprout development and for this reason may be more desirable with certain species [25], for other species it has been found that a fairly deep girdle is necessary to ensure killing the tree. Experience in Malaya has shown that peeling the bark is often followed by callus formation across the girdle and the recovery of the tree [19, 38]. Notch-girdling as used in Malaya gives about 75 per cent. success within 18 months with two-thirds of the balance dying in three years.

* A number of workers have investigated the physiological effects of girdling on trees and other plants. From observations made in hardwood species in the north-eastern States, Baldwin [6] reports *inter alia* that abnormally large percentages of sugar were trapped above the girdle during the first season after the girdling, while, at the end of two years, sugar reserves, even in the region above the girdle, were less than in ungirdled trees.

† On the basis of work with hardwoods (mainly Oaks and Hickories) in the southern United States, it has been estimated that frilling requires about 0·4 min. for a 6-in. tree, 0·6 min. for a 10-in. tree, 0·8 min. for a 14-in. tree, and 1·0 min. for an 18-in. tree, double-hacking requires approximately double the time, and notch-girdling 4 to 5 times that required for frilling.

It has been recommended that for those hardwoods that are difficult to kill by girdling, the cut should be at least 2 in. into the sapwood.

However, notch-girdling is relatively expensive, and in many cases other methods may be more efficient. Experiments in the southern United States [13] have shown that frilling of trees 4–23 in. d.b.h. of species of Oak, Hickory, Elm and Gum (*Nyssa sylvatica* and *Liquidambar styraciflua*) resulted in the death of practically all trees 3 to 5 years after the operation, high percentages of trees being killed within the first year. Other investigations have shown that although frilling is the cheapest method it is effective only if done by competent axemen, as phloem strands may be left intact if the cuts do not completely overlap [6, 42]. There is fairly general agreement that double-hacking, exposing a 4-in. band of sapwood, is the best combination of effectiveness and low cost. Peeling has been found to be effective with hardwoods in the north-eastern United States, but it should be used only during the bark-slipping period. In general the cost of girdling is probably lower if only competent labour is employed, even though higher wages are paid than for unskilled axemen.

The season of the year in which girdling is done appears to be an important factor though little specific information on this point is available. Girdling experiments begun in India in 1939 with *Anogeissus latifolia*, *Terminalia tomentosa* and *Eugenia jambolana* show that the season when girdling is most effective varies with each species [22]. Sprouting of girdled hardwoods (Oaks and Hickories) in the southern United States was greatest for those trees treated in October, least for those treated in May, and intermediate for those treated in July [13], while the girdling of Grey Birch (*Betula populifolia*) resulted in lowest sprout production when done in January [35]. The spring and early summer appear to be the best times for girdling Western Hemlock and Grand Fir [10].

One of the main criticisms of this method is the high proportion of trees that survive incomplete girdling—a condition that is due mainly to the employment of inexperienced or incompetent labour and probably in some degree to the use of inefficient tools. The axe is the tool most commonly used in girdling and is highly effective in the hands of a competent axeman. Chain saws and hand saws designed specifically for girdling have been used successfully [7], and in some cases have been found to be cheaper and more effective than the axe [13]. Two saws designed for removing a ring of Oak bark wide enough to prevent bridging without severing the vessels in the sapwood have been described in a recent paper [24].

Poisoning.

Considerable success has resulted in the use of poisons for killing "weed" trees and in some regions this has been adopted as a routine method in forest improvement operations [8, 39] and also has fairly wide application in land-clearing operations [3, 4, 9, 11, 25, 28, 29, 30, 40]. Advantages claimed for it in comparison with girdling include lower cost, earlier and more complete killing of the crown, and reduced sprouting. In killing Oaks and Hickories it has been found that, especially with smaller trees, poisoning is more effective than girdling in controlling sprout development [20]. An experiment with eastern American hardwoods has shown that in comparison with felling or notch-girdling, poisoning with sodium arsenite applied in frill girdles gives the best combination of cheapness and effectiveness in killing the crowns in the shortest time and in reducing basal sprouting [27]. One year after the treatment, the crowns of 85 per cent. of the poisoned trees were dead and those of 90 per cent. of the remainder were dying. Experiments in Malaya have shown that following the application of sodium arsenite in frill girdles higher percentages of trees were killed more quickly than by the use of notch-girdling [38]. An advantage of poisoning mentioned in connection with the use of sodium arsenite in thinning Ponderosa Pine is that trees so killed have escaped or been immune from the usual attack of *Ips* [23].

While the use of poisoning has given satisfactory results with some species it doesn't follow that it is superior to girdling in all cases. Experiments undertaken in the southern United States with various hardwoods indicated that in comparison with girdling, poisoning did little to reduce sprouting, it was more expensive, and poisoned trees disintegrated in much the same way and at the same rate as girdled trees [13]. On the basis of these results it is suggested that for trees which succumb fairly easily to girdling this method is preferable unless very rapid killing is desired.

A number of different chemicals have been tested for their tree-killing qualities, and the results with individual poisons have varied considerably. One of the earliest references to this method was in the use of Atlas preservative for killing various Indian species [2]. The preservative was applied undiluted to a girdle, and the trees were killed in less than a fortnight. Arsenicals appear to give the most consistently satisfactory results and are most widely recommended [3, 5, 9, 13, 18, 27, 31, 39]. Commercial white arsenic has generally been found to be effective and has been used successfully at various concentrations. Expressed in pounds of white arsenic, pounds of lye and gallons of water, respectively, effective formulas include:—1–0–1, 1–$\frac{1}{2}$–4, 1–1–2, 1–1–4, 1–2–1, 1–2–2, 1–3–4, 2–0–1, 2–$\frac{1}{2}$–1, 4–1–$\frac{3}{8}$, 5–0–1 (for rubber trees). The poison solution may be prepared by dissolving the soda in water, adding slowly a paste made by mixing the white arsenic with water, boiling the mixture for at least an hour, and adding water to give the required quantity of solution. The quantity necessary to kill a tree varies with species and size; about one quart is sufficient to kill a tree 4 ft. in diameter [28].

While sodium arsenite is the chemical most generally recommended for killing trees, in New South Wales it has been largely superseded by arsenic pentoxide, which appears to have greater penetrating power than the former compound against trees that are liable to sucker. In Tanganyka experiments have shown this poison to be the most effective of those tried, including arsenite of soda, for eradicating Acacias and other scrub [4]. Concentrations recommended for arsenic pentoxide include 3 lb. per 5 gal. of water and 1$\frac{1}{2}$ lb. per gal. of water.

As both sodium arsenite and arsenic pentoxide are deadly poisons to man as well as to animals, every precaution must be taken in handling them and in deciding where they are to be used.

The following is a representative list of other substances that have been found to be effective in killing trees and shrubs:—sodium and calcium chlorates; potassium chromate and bichromate; copper and iron sulphates;

copper, sodium, barium and zinc chlorides; ammonium thiocyanate; formaldehyde; carbolic acid; sodium fluoride; sodium hydroxide; ethylene oxide; cresylic acid; kerosene; and creosote [13,39].

Methods that have been used for applying poisons to trees include:—(1) swabbing or pouring the poison into a complete girdle or frill around the tree, (2) swabbing or pouring the poison into one or more unconnected hacks, (3) swabbing the poison on a completely peeled section of the bole, (4) pouring solutions or placing crystals of the poison in auger holes bored into the bole or root, (5) spraying poison on the foliage. The first of these appears to be generally the most effective method, particularly with species that are difficult to kill. While successful results have been obtained by applying the poison to a number of unconnected hacks (not more than 1 in. apart) [18], in other cases this method has been ineffective [13]. The equipment generally used includes an axe for making the frills or hacks and a container equipped with a long spout. Special tree-killing tools have been designed by Cope and Spaeth [18] and MacKinney [26], which combine the operations of cutting the bark and injecting the poison, and are said to reduce the cost. In both cases the poison is stored in the long tubular handle of the tool and is injected into an incision made by jabbing the cutting edge into the bark and sapwood.

The application of poison in auger holes bored into the bole or root of the tree has been found unsatisfactory with certain species, and it is considered that this method is more difficult and time consuming than frill-poisoning [18, 36, 38]. However, it has been used successfully in killing scrub Oak and in checking sprout production. For this purpose a strong solution of sodium arsenite (white arsenic 40 lb., caustic soda 10 lb., water 15 pt.) was poured into holes 1 in. deep and ½ in. diameter in the large roots just below the root collar [32]. One hole is usually sufficient for trees less than 3 in. in diameter while larger trees require two or more holes. These can be made with either an auger or a tool specially designed for the purpose [33]. It has been shown that two injections of 25 cc. of a solution of sodium arsenite, each injection containing the equivalent of 4 gms. of As_2O_3, are sufficient to kill Ponderosa Pine up to 12 in. diameter [23]. Injections are made in two ¾-in. holes, each 5 in. deep and 2·5 ft. above ground, on opposite sides of the tree and at an angle of 45° downward, or else inward from the tangential just enough to keep the incisions within the bole.

In controlling Velvet Mesquite (*Prosopis velutina*) a stock solution of sodium arsenite is prepared by mixing 8 lb. arsenic trioxide powder with 2 lb. caustic soda flakes and dissolving the mixture in 3 qt. water to make 1 gal. of stock [30]. Small trees less than 3 in. in diameter are best treated by digging a shallow basin or trench round their base and pouring in about 1 pint of a solution made by diluting the stock with 6 parts of water. Larger trees should be frill-poisoned: for this purpose 1 part of stock should be diluted with 3 parts of starch in a small amount of water, adding 1 gal. of boiling water and cooking till clear. One gallon of the "stock solution" is enough to treat about 55 trees by the basin method or 320 trees by girdling.

Common salt heaped about the root collar without making an incision in the bark has been used successfully in killing small trees of certain species [31].

There is little experimental evidence to indicate the best season of the year in which to poison trees. It has been pointed out that when control of sprouting is of primary importance the poison should be applied when the tree is dormant and the sap is down in the roots and lower parts of the trunk [3, 28]. However, experience in killing Acacia trees in East Africa indicates that best results are obtained, even with a relatively weak solution, if it is applied during the summer months [4], and the poisoning of hardwoods in the north-eastern United States was found to be most effective when done between August and December [18, 25].

Exposure of the tree, in its effect on evaporation and transpiration, may have an important bearing on the rate at which poisoning is effective [39].

Sprout Control.

As has already been indicated, one of the most important factors to be considered in the killing of hardwoods, whether by felling, girdling or poisoning, is the control of sprout and sucker growth. It has been shown that both girdling and poisoning of standing trees have an advantage in this regard. While poisoning is probably more effective if applied to standing trees than to the stumps or stubs of felled trees, the latter method has been used successfully with a number of species. The best of a number of treatments tested for preventing the sprouting of stumps of eastern American hardwoods was complete hacking or ringing of the stumps, followed by an application of calcium chlorate solution or ammonium thiocyanate solution [40]. The cost of this treatment was less than that of annual or even biennial machete treatments. Incomplete hacking or drenching the stools or the twigs and leaves of the sprouts with poison was ineffective. In these experiments no significant difference was observed between the sprouting of chopped and of sawn stumps.

Sodium chlorate was found to be the most effective and reliable chemical of those tested for preventing the sprouting of stumps of various California hardwood species [11]. The treatment consists of four operations:—(1) all sprouts are chopped off at the crown, (2) all live portions of the stump are unearthed and exposed, (3) all live tissue is scarred by light hacking through the bark, (4) a 10-per-cent. aqueous solution of the poison is applied as a spray. A single treatment of this kind should result in the complete killing of 95 per cent. of the stumps, except for very large ones exceeding 25 in. in diameter. One gal. of solution should be sufficient for 6–10 stumps.

In killing rootstocks of Eucalypts best results were obtained by exposing the cambium around the periphery of the stump and applying arsenic pentoxide, 1 lb. to 2 gal. of hot water, towards the end of the summer [36]. This poison was also effective in controlling Acacia and other scrub growth in East Africa. The trees were felled 2 to 3 in. above ground, the stump was slightly split, and the poison (1½ lb. per gal. of water) was applied with a brush to the cut portion of the stump [4].

For a method that is effective and at the same time protects livestock and wild life, it is recommended that the stump should be completely girdled below the ground, small quantities of poison should be poured into the cuts, and the soil should be replaced, so that girdle and poison are completely covered [25].

Apart from poisoning, methods used for eliminating sprouts include repeated mowing, grazing, burning, ploughing, and the use of specially designed sprout cutters [9, 25]. The breaking of sprouts from the stumps of Black Cherry in early summer (just before the period of most rapid growth), for two or more consecutive years, has been found to be cheaper and more effective than girdling or peeling in eliminating undesirable sprout growth [29].

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THEORETICAL STUDIES OF LOGGING OPERATIONS*

For the past 15 years or so Swedish foresters have been fully aware that forestry, like every other industry, must be systematically rationalized if its products are to maintain their position in general competition. A satisfactory basis for a theoretical consideration of any measure of rationalization has, however, long been lacking, and new ideas have frequently had to be tried more or less at random. By about 1935 it had become evident that the first steps towards rationalization should be to ascertain, by means of careful time studies, the distribution of the costs under present working methods. For this purpose two organizations—the Time Study Section of the Forestry Association and the Värmland Forestry Association—began in 1938–39 to make investigations on these lines in different parts of the country. An account of the work done by the last-named of these institutions is given in the book under discussion, which has been published by the Swedish Institute of Industrial Research.

In the preface to this book, from which the above is an extract, Chief Forester G. Wesslén, who is Chairman of the Board of the Institute, has defined the objects of the investigations as follows:—

1. To ascertain the influence of purely "forest" conditions on the difficulty of the work.
2. To select the most suitable tools.
3. To determine standard performances.

The introductory chapter (also written by G. Wesslén) gives an account of previous attempts at time and other studies of Swedish forestry work, and of certain specific experiments in rationalization.

Chapter 2, written by G. Luthman and P. O. Olsson, presents a schedule of the principal constituent elements of logging operations, with definitions and descriptions of each. A summary is given of the instructions followed in the logging operations studied.

Time Study Methods.

Chapters 3–5, by G. Luthman, describe the time studies that were undertaken. Chapter 3 demonstrates that time studies in forestry cannot be arranged in the same way as in other industries. The fundamental principle of time studies generally adopted is that it should always be possible to differentiate quite definite "piece times," which always average the same for each unit of production. Any attempt to use methods in forestry, based on this principle, should consequently be directed to finding the basic "piece times" for whole trees or parts thereof, from which piece-work rates (plus time allowances for tool setting) might be calculated, for each individual case, by determining the number of units, i.e. trees or logs. However, the labour entailed in felling and converting trees varies from one tree to another, and from one unit to another of the assorted logs cut from each tree, thus preventing the definition of standard times for piece work. It is, therefore, impossible to fix any "piece times" that are generally applicable to large areas of forest. If it were desired to establish an objective pricing system fully in accordance with the "piece-time" method, it would be necessary to determine so many "piece-times" as to make the cost of the basic studies prohibitive.

In certain earlier attempts at time studies in forest work a modified "piece-time" method was tried out. This limited the required number of "piece times" by introducing the qualifying factor "degrees of difficulty." Thus, when making time measurements the observer had to estimate the "degrees of difficulty," i.e. by how much the observed time should differ from a value determined as the standard for the particular kind of work being done. This method was soon found to be extremely uncertain in application. The difficulty of barking a tree trunk, for instance, varies with the diameter and taper of the tree, the thickness of the bark, the ratio of living and dead bark, and with the position of the bark whether at the butt or top of the tree. Thus, not even for an individual tree can the difficulty of barking be expressed numerically.

To attempt a solution of this problem the Värmland Forestry Association has considered it with reference to mechanics. The worker is regarded as functioning like a machine, the working speed of which bears a certain relation to the external resistance, and each element of the work is considered equivalent to the performance of a certain amount of external mechanical work. For example, the consumption of energy required in barking a tree, when the bark is frozen and when it is not frozen, has been determined by laboratory experiments.

The investigations that have been undertaken along these lines include:—

1. Studies to determine the factors deciding the technique of the work and the amount of work done by one stroke of an axe, a saw, etc.
2. Studies of the factors which, in the forest, determine the total number of strokes required for different kinds of work on each tree.
3. Studies to determine the rates of movement of saws, axes, etc.

A knowledge of these three groups of factors will obviously make it possible to determine the time required for work under ordinary circumstances. It is pointed out, however, that a very strict limitation of the variables included in the equations used is necessary. The results obtained from these investigations are not considered as final or definite, but are intended only as reasonably satisfactory aids in the practical determination of piece-work rates. The investigations covered about 5,000 trees and the necessary calculations were obviously very extensive. However, it is shown that considerable simplification is possible by making graphs of the functions desired.

* A summary of Studier i Skogsbrukets arbetslära. Undersökningar vid Värmlands Skogsarbelsstudier — I. [Theoretical studies of logging operations. Investigations by the Värmland Forestry Association, I.] Industriens Utredningsinstitut, Stockholm — 1943. pp. 267 [Sw.].

TOOLS.

It is emphasized that only efficient tools should be used in time studies. The types of tools used by forest workers were studied and they were found to vary widely, many inferior types being still in use. Fairly exhaustive investigations were therefore undertaken with a view to producing a standard set of good tools. The results are summarized by G. Luthman in Chapter 7.

These investigations were carried out along two different lines:—(*a*) Laboratory experiments were made to determine the optimum cutting angles and sets for saw teeth and the optimum cutting angles for tool blades used in barking. (*b*) Opinions were obtained from a large number of forest workers on various types of tools after they had given them a thorough trial.

Graphs and tables illustrate some of the results obtained in the first (*a*) series of investigations. For instance, it is shown that the consumption of energy in sawing a bolt with a cross-cut saw varies with the set of the saw. The optimum values for certain conditions are given in the table below.

Species and condition of bolt	*Diameter cm.*	*Optimum set mm.*
Pine, not frozen	25	1·15
	20	1·16
	15	1·13
Pine, frozen	25	1·11
	20	1·11
	15	1·10
Spruce, not frozen	25	1·13
	20	1·15
	15	1·11
Spruce, frozen	25	1·25
	20	1·14
	15	1·15

It is shown that even so slight a change as 0·1 mm. in these optimum values resulted in a definite increase in energy consumption. Therefore, the greatest care in the setting of tools is essential if best results are to be obtained.

The practical tests (*b*) have been directed towards finding out the weight of tools, dimensions of handles, etc., that are preferred by forest workers. A number of standards have been proposed on the basis of the information thus obtained.

PHYSIOLOGICAL INVESTIGATIONS.

No direct observations of the physiological factors affecting work in the forest had previously been made in Sweden. Investigations in other countries have been limited to laboratory observations of the energy consumed in sawing, but the results were not considered applicable to conditions in Sweden. For this reason, and because tree-felling in the forest is one of the most arduous forms of manual labour, the Värmland Forestry Association, with the assistance of medical experts, initiated a series of physiological investigations covering all ordinary forms of forest work, the tests being made in the natural environment of the persons tested. The objects of this work were:—(1) To determine the energy consumption in forestry work by measuring the respiratory exchange, using the Douglas-bag method; (2) To determine, if possible, the fatigue resulting from such work; (3) To investigate the means by which forest workers were able to supply their high energy requirements from the rather scanty war-time rations. This was done by studying the individual food consumption over a period of two weeks.

One result of the first series of investigations was the following table which shows the average consumption of energy of the workers, reckoned in cal./min., resting and at work.

Work done	*No. of persons tested*	*Cal./min.*
Resting	4	1·66
Tree felling with one-man cross-cut saw	4	7·71
Tree felling with one-man cross-cut saw and "sawing mate"*	4	9·87
Cutting pulpwood	4	7·52
Cutting cordwood	3	8·23
Barking, in summer	3	8·15
Barking, in winter	1	10·41
Lopping branches	3	9·14
Splitting cordwood	3	8·37

* A "sawing mate" is a mechanical device that takes the place of the second man on the saw. It is essentially a strong spring attached to the handle of the saw and to the log or tree on the side away from the sawyer; its purpose is to reduce the effort required in pushing the saw forward.

From these data and from information on the distribution of work throughout the day, it has been estimated that the average consumption of calories per hour while on forestry work, including rests, is 445 cal., which is slightly higher than that indicated in earlier German investigations.

The total consumption of energy in 24 hours has also been calculated, as shown in the following table:—

Time in hours	*Occupation*	*Cal./hour*	*Total number of calories*
8	Sleeping	85	680
1	Meals at home	100	100
1	Walking to and from forest	360	360
8·5	Working	445	3,780
1	Principal meal, in forest	100	100
4·5	Light work at home	150	675
24·0		Total	5,695

The total output of energy for a full working day should thus be about 5,700 cal. The same figure was obtained in the investigations on the effect of food rations (3 above), although the two studies were carried out independently of one another.

The analysis of conditions governing fatigue (2 above) was limited to observations on variations in the glucose content of the blood due to forestry work. It is pointed out that too little glucose in the blood will produce marked symptoms of fatigue and increase the risk of accidents, and that the severe strain of forest work may easily result in an excessive reduction in blood sugar. Although the investigations covered only 3 persons, the glucose content in one of these dropped far below the permissible level in the course of work. Under certain conditions it is obviously important to see that forest workers are given suitable sugar rations during working hours.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. TERMINOLOGY. NOMENCLATURE. BIBLIOGRAPHY

01.2 : 12.2 (410). **British Ecological Society: memorandum on nomenclature and taxonomy in the biological flora.** *J. Ecol.* 31, 1943 (93–6).

The Council of the British Ecological Society is of the opinion that the practice, recommended in the International Rules of Botanical Nomenclature, of spelling with initial capitals those specific epithets which are old generic names or are derived from personal names or vernaculars, constitutes an unnecessary and undesirable source of error, and it proposes to follow the example of zoologists and discard all initial capitals in specific epithets.

In order to help in establishing uniformity in the nomenclature of intraspecific units the Editorial Committee of the Council has set out a statement of the practice recommended in the use of the terms:—species, subspecies, variety, form, ecotype, cytotope and geneto-type.

01.6 : 33.12. **A bibliography on the machining of wood.** American Society of Mechanical Engineers (Wood Industries Division), New York. 1939. pp. 74. *Bull. Inst. Paper Chem.* 13, 1943 (301). P.O.

01.6 : 12.26–8 : 34.24. **Cork Oak and its uses: a selected list of references compiled in the library, United States Department of Agriculture.** U.S. Department of Agriculture. 1942. pp. 16.

04. MAPS. PHOTOGRAPHY

04.5. MILLER, C. I. **Three-dimensional photography for the forester.** *J. For.* 41, 1943 (406–10).

Descriptions are given of a simple method of making stereograms and hyperstereoscopic pictures with a single-lens camera, and of the processing, mounting and viewing of stereograms. Notes are included on items of equipment and techniques relating to three-dimensional photography.

05.3. *Annual Reports*

05.3 (54.2). UNITED PROVINCES. **Annual progress report of Forest Administration in the United Provinces for the year 1941–42.** Superintendent, Printing and Stationery, Allahabad. 1943. pp. 20 + xx.

05.3 (67.6). UGANDA. **Annual report of the Forest Department for the year ended 31st December, 1942.** Govt. Printer, Entebbe. 1943. pp. 8.

05.3 (68.1). BECHUANALAND. **Annual report of the Department of Forests for the year ended 31st December, 1942.** [Department of Forests, Bechuanaland.] 1943. pp. 3.

05.3 (71.11). ALBERTA. **Annual report of the Department of Lands and Mines of the Province of Alberta for the fiscal year ended March 31st, 1942.** King's Printer, Edmonton. 1943. pp. 106.

05.3 (729.2). JAMAICA. **Annual report of Forest Division, Department of Agriculture, for year ending March 31st, 1942.** (Abbreviated report.) Department of Agriculture, Kingston, Jamaica, B.W.I. [1942?] pp. 3 + tbls.

05.3 (73). UNITED STATES. **Forestry in wartime. Report of the Chief of the Forest Service, 1942.** Govt. Printing Office, Washington. 1942. pp. 23.

05.3 (73). UNITED STATES. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 60.

05.3 (73). UNITED STATES. **Report of the Chief of the Bureau of Plant Industry, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 27.

05.3 (74.7). NEW YORK STATE. **The New York State College of Forestry at Syracuse University: annual report, 1942.** Albany, N.Y. 1943. pp. 73. *Legislative Document* (1943) No. 19.

05.3 (74.7). NEW YORK STATE. **Cornell University Agricultural Experiment Station. Fifty-fifth annual report, 1942.** Ithaca, New York. [1942?]. pp. 192.

05.3 (76.5). ARKANSAS. **Ninth annual report of the Forestry Commission for the fiscal year ending June 30, 1942.** Arkansas Forestry Commission. [1942?] pp. [28].

05.3 (77.7). IOWA. **Report on agricultural research for the year ending June 30th, 1942. Part I. Projects reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa. 1942. pp. 1–18, 65–6, 93–112, 149–58, 183–8, 253–93.

05.3 (88.1). BRITISH GUIANA. **Report of the Forest Department for the year 1942.** Govt. Printer, Georgetown, Demerara. 1943. pp. 3.

05.3 (943). QUEENSLAND. **Report of the Director of Forests for the year ended 30th June, 1942.** Govt. Printer, Brisbane. [1942?] pp. 4.

05.3 (943). QUEENSLAND. **Annual report of the Department of Agriculture and Stock for the year 1941–42.** Govt. Printer, Brisbane. 1942. pp. 27. I.I.E.

07.2. *Research*

07.2 : 05.3 (485) : 24 : 12.19.2 : 12.11 : 45.3. SWEDEN. Redogörelse för verksamheten vid Statens Skogsförsöksanstalt under år 1939. **[Report on the work of the Swedish Institute of Experimental Forestry in 1939.]** *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (381–9). [Sw.] E.F.A.

The retirement of Professor Henrik Hesselman and various appointments are announced.

I. Forestry Section.

The research work of the Section proceeded as usual. Naslund's investigations, begun in 1937, on the reaction of old Spruce forests to different types of felling were almost completed and the results are to be published.

The total reconnaissance surveys of the different permanent experimental forest areas in various localities are shown in a table.

Activities in connexion with the experimental parks were continued.

II. Natural Science Section.

Professor Hesselman investigated the temperature in the humus cover under burning brush and the resistance of Pine and Spruce seed to the heat resulting from this operation.

Carl Malmström continued his investigations in Västerbotten on the flora, composition and range of the northern Swedish forest types and their relation to geology, soil humidity and climate. Lars-Gunnar Rommel was occupied with research on soil manuring and root isolation in Orsa Finmark and on dry and green pruning, while O. Langlet's genetic and physiological investigations on forest trees comprised studies on the progeny of Pine and Spruce of German origin grown in Sweden, climatic races and experimentally induced intensification of winter colouring in Pine from various localities.

Root and mycorrhiza formation was studied in Pine, Spruce and Birch.

III. Forest Entomology Section.

Biological studies were made of different pests of forest trees including the Pine sawyer (*Monochamus sutor*), a sawfly (*Pristophora abietina*) attacking Spruce, the Pine beetle (*Myelophilus* sp.), and the Pine spinner (*Dendrolimus pini*).

The Director read a paper on 'New Trends in Forest Entomology in Sweden' (Nyare riktlinjer inom den svenska skogsentomologien).

Numerous publications issued by the three sections are cited.

07.2 : 05.3 (485) : 24 : 12.19.2 : 12.11 : 45.3. SWEDEN. Redogörelse för verksamheten vid Statens Skogsförsöksanstalt under år 1940. **[Report on the work of the Swedish Institute of Experimental Forestry in 1940.]** *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (390–5). [Sw.] E.F.A.

The appointment of Dr. Carl Malmström as Director of the Natural Science Section of the Institute is recorded.

I. Forestry Section.

Experiments on thinning in Pine and Spruce forests and on the reaction of old Pine woods (in Norrland) to different methods of felling have reached the stage when reports on progress can be made.

The survey of the experimental forest areas of the Norrland Division, begun in 1939, is nearing its conclusion. Investigation of the Oak areas of the Institute was started.

The usual table is given showing the total reconnaissance surveys in the permanent experimental forest areas.

Work in the experimental parks proceeded as usual.

II. Natural Science Section.

Carl Malmström continued his investigations for a monograph on the forest types in Västerbotten district, on their geographical distribution within the area, on the factors, ecological and otherwise, determining the composition and structure of individual stands, on the factors affecting regeneration and on trends in development following various silvicultural operations.

Lars-Gunnar Rommel conducted extensive experiments on the soil reaction following thinning and also completed his work on dry and green pruning.

Langlet continued his genetical studies, some being in conjunction with the international provenance experiments in which the Institute is taking part. New provenance experiments were begun in Västerbotten by Langlet for a study of climatic races of forest trees.

Other investigations in progress concern root and mycorrhizal formation in Pine, Spruce and Birch on the Häll boglands where manurial trials are being carried out. Extensive experiments are also in progress on mycorrhiza in Pine and Spruce growing on forest soils with different nutrient contents and under different light conditions.

III. Forest Entomology Section.

The Director continued his research on pests of conifers and deciduous trees and, in Västergotland, on the conditions under which timber acts as a centre for the development of the bark borer.

Forsslund undertook a study of mass infestation by the red sawfly of Pine (*Neodiprion sertifer*) in Småland. Butovitsch continued his work on the ecology of the Pine beetle (*Myelophilus* sp.) and also co-operated in experiments in Jämtland on wood preservation in the forest and the care of trees damaged by fire.

A list of publications issued during the year is given.

09.2. *Pre-history*

09.2 (51). **Fossil wormholes.** *Science* (*Supplement*) 92 (*n.s.*), (2395), 1940 (11). L.S.

Wormholes, $\frac{1}{16}$–$\frac{1}{4}$ in. in diameter, have been discovered in petrified tree stumps in a fossil forest in northern China. Some of the holes contain frass, but no trace of the borers has yet been found. The wormholes occur to a depth as great as 3 in. beneath the bark.

09.2 (54.1) : 12.26–8 : 581.1. MUKHERJEE, A. **A fossil dicotyledonous wood from Bhanugach Reserve Forest, Sylhet District, Assam.** *Sci. & Cult.* 8, 1942 (141–2). [Geological Laboratory, Presidency College, Calcutta.] L.S.

The fossil wood from Bhanugach Reserve Forest, Assam, showed the anatomical features ascribed by Chowdhury to the Dipterocarpaceae. The vessels, tracheids, fibres, parenchyma, and gum ducts are described.

09.2 (74.9) : 12.19.4. POTZGER, J. E., and OTTO, J. H. **Post-glacial forest succession in northern New Jersey as shown by pollen records from five bogs.** *Amer. J. Bot.* 30, 1943 (83–7). [Butler University, Indianapolis.] L.S.

The study reported in this paper indicates that in New Jersey the *Picea/Pinus* association, which followed the Lake Wisconsin glaciation, was gradually replaced by *Pinus*, which appears to have controlled the crown cover for a period represented by 3–4 ft. of peat. This was succeeded by a *Pinus/Quercus/Tsuga* association, followed by a *Quercus/Castanea/Tsuga/Pinus* association in which *Pinus* was of decreasing importance. *Fagus*, *Acer*, *Juglans* and *Tilia* are represented by low pollen percentages, indicating that these species have invaded the area very recently.

09.2 (76.8) : 12.26–8. CAIN, S. A. **The tertiary character of the cove hardwood forest of the Great Smoky Mountains National Park.** *Bull. Torrey bot. Cl.* 70, 1943 (213–35). [University of Tennessee.]

An attempt is made to show by indirect means that many of the genera now present in the cove hardwood forests are of ancient origin, and that species of the same genera existed in the southern Appalachian region in Tertiary times. It is assumed that the species of the past had much the same climatic requirements as species of the same genera to-day and that therefore the nature of the prototypes of certain genera can be deduced. From the evidence which he has accumulated the author concludes that of all the trees of the Park (representing 67 genera) 93 per cent. are of genera which were present in the Tertiary period. Of the cove hardwood trees sampled (28 genera) 86 per cent. are believed to be ancient genera. The forest dominants (*Fagus*, *Castanea*, *Ulmus*, *Alnus*, *Betula*, *Corylus*, *Populus*, *Juglans*, *Carpinus*, *Liquidambar*, *Sequoia*, and *Ginkgo*) are said to be exclusively of ancient origin.

09.2 (77.2) : 12.19.4. KELLER, C. O. **A comparative pollen study of three Indiana bogs.** *Butler Univ. bot. Stud.* 6, 1943 (65–80). A.P.B.

Pollen spectra from Jeff, Shipshewana and Culver bogs in northern Indiana showed almost the same forest succession:—*Picea*/*Abies*, to *Picea*/*Pinus*/*Quercus*, to *Quercus*/*Carya*, to *Quercus*/*Carya*/*Acer*/*Fagus*. During its period of dominance *Pinus* was more prominent in Shipshewana and Culver bogs than in the more southerly Jeff bog.

The following climatic changes are indicated by the spectra: cold (*Abies*/*Picea*), cool moist (*Abies*/*Picea*/*Pinus*), warm dry (*Quercus*/*Carya*), warm moist (*Quercus*/*Carya*/*Acer*/*Fagus*).

09.2 (77.5) : 12.26–8 : 12.19. CAIN, S. A. **A note on 'Fossil evidence of wider post-pleistocene range for Butternut and Hickory in Wisconsin'.** *Rhodora* 45, 1943 (107–9). [University of Tennessee, Knoxville, Tenn.] O.B.D.

A critical review of a paper by L. R. Wilson and R. M. Webster in *Rhodora* 44, 1942 (409–14). It is considered that the small percentages of pollen of *Carya* and *Juglans* present in the peat profiles examined are not sufficient, in the absence of other evidence, to justify conclusions as to the past areal limits of these species. [Cf. *For. Abstr.* 5 (9).]

09.2 (77.5) : 12.19.4. POTZGER, J. E. **Pollen study of five bogs in Price and Sawyer Counties, Wisconsin.** *Butler Univ. bot. Stud.* 6, 1943 (54–64). A.P.B.

The main purpose of this study was to determine whether the Quercus extension into the southwestern part of Minnesota had, in early post-pleistocene times, affected a wider area in northern Wisconsin. No indication was found of there ever having been a climate favourable to the expansion of *Quercus* as a vital component in the crown cover of the forests. Forest succession in the region is shown to have been broadly *Picea* (*Picea*/*Pinus*) to *Pinus* to *Pinus*/northern hardwoods.

09.2 (79.5) : 12.19. CHANEY, R. W. **The record of local diversity in the Bridge Creek flora.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (4s). [University of California, Berkeley, Calif.] L.S.

The Bridge Creek flora from the John Day Basin of Oregon represents a middle Tertiary forest in which the Redwood was a dominant tree. Collections and specimen counts from several localities have yielded a total of more than 32,000 leaves and fruits, of which *Sequoia langsdorfii* and other fossil species with living equivalents in coastal California is nearly 80 per cent. The remainder have equivalents now occupying regions with summer rainfall, in eastern North America and eastern Asia. There is a marked variation in representation between localities, and at one locality the percentage of certain species may vary greatly within short distances horizontally and vertically. *Cercidiphyllum crenatum*, a characteristic member of the East Asian element, is well represented at one locality only (Dugout Gulch), and even here it may be rare or absent at certain pits. Such irregular occurrence is consistent with the observed occurrence of its living equivalent, *C. japonicum*, in Asia. *Fagus pacifica*, *Castanea orientalis* and *Tilia oregona* of the East American element also vary greatly in abundance, as is the case with their living equivalents in the mixed deciduous forests of Kentucky. The predominance of *Sequoia langsdorfii* at the Twickenham locality, where it is 78 per cent. of the total, suggests an essentially pure stand on a valley flat. The abundance of the Small-leafed Evergreen Oak, *Quercus clarnensis*, at Crooked River, where Redwood is only 3 per cent., suggests greater slope exposure, possibly on the leeward side of a climatic barrier. Such quantitative data provide a basis for a better understanding of the composition and environment of Tertiary forests.

09.4. *Forest Statistics*

09.4 (43.8). **Polish timber problems.** *Timb. Tr. J.* 165, 1943 (579–80, 582).

After 4 years' German occupation of Poland losses to forests, due mainly to overcutting, are estimated at 120 million cu. m.

09.4 (71) : 98.1. CANADA. **Estimate of forest production, 1941.** Dominion Bureau of Statistics, Ottawa. [1942?] pp. 8. [E.F.]

The estimated or reported total production of each of the principal wood products is tabulated together with its equivalent in volume of standing timber and its value. Forest production in terms of standing timber and value is recorded for each province, and figures are given for the value of each of the principal forest products for 1941 and the preceding four years. The total value for forest products in 1941 is estimated at $213 million.

09.4 (71) : 98.1–2. CANADA. **Statistical record to 1940 of the forests and forest industries of Canada.** Dominion Forest Service, Ottawa. 1943. pp. [2] + 19 tables + dgms.

A series of charts and tables illustrates the status of the forest resources of Canada according to the best information available at the present time. Subjects dealt with include classification and ownership of land, merchantability, accessibility, depletion and production of forests, statistics of the lumber and pulp industries, imports and exports of forest products.

09.4 (71) : 43. **Forest fire situation in Canada, 1942.** *Timber of Canada* 3 (9), 1943 (46, 48, 52).

Statistics are given for forest-fire losses during 1942 in Quebec, Ontario, British Columbia, Alberta, Saskatchewan, Nova Scotia and Manitoba.

09.4 (73) : 98.1. **U.S. lumber consumption far above current production schedules.** *B.C. Lumberm.* 27 (6), 1943 (120, 122).

During the first quarter of 1943 timber production in the United States totalled 6,269 million bd. ft., while

consumption was greater than output by 18 per cent. Production had decreased by 14 per cent. from that of the previous quarter and by 13 per cent. from that of the first quarter of 1942.

09.4 (73) : 33.8. STEARNS, J. L. **Wood replacing over five million tons of metal in 1943.** *Sth. Pulp Paper J.* 6. (1), 1943 (13). [National Lumber Manufacturers Ass.]

Manufactured products in which, in the United States, wood is being used to replace metal are listed with the quantities of plywood and lumber used and the approximate amounts of metal conserved. Totals show 457 billion sq. ft. of plywood and 5 million bd. ft. of lumber being used to conserve 5 million tons of metal.

09.4 (75.5). **Virginia forest resources.** *Sth. Pulp Paper J.* 5 (12), 1943 (8–9, 20).

The commercial forest area of Virginia occupies nearly 14½ million acres or 56 per cent. of the land area of the state. The major softwood species are Loblolly, Shortleaf, Virginia and White Pines, and the hardwood species are mainly Oaks, Gums and Yellow Poplar. Two per cent. of the forest is old growth and 98 per cent. second growth. Net sawtimber volume is estimated at 24·3 billion bd. ft., consisting of hardwoods and softwoods in about equal amounts. Most of this volume is in trees under 20 in. in diameter and many of the stands are understocked. Overall figures for 1940 show an increase in total sawtimber of 325·4 million bd. ft., mainly in the hardwoods, while there was a significant decline in the larger diameter softwoods.

09.4 (75.5) : 98.2 : 91 : 60.31.2 : 96.5. VIRGINIA. **Major forest problems in Virginia and a plan to maintain forest lands in the state in a more productive condition.** [Virginia Forest Service.] 1942. pp. 28 + 6 + 4 + plates.

Data on the forestry and timber industry of Virginia are summarized, and recommendations are made for intensified fire protection, for encouragement of conservative management in private forests, and for the distribution to landowners of planting stock from state nurseries, to be used in the afforestation of idle and eroded lands.

09.4 (75.6–8 : 76.1–2 : 76.8–9) : 97.1 : 12.19.2 : 98.1. **Forestry data for the Tennessee Valley. Part I. Area data for valley counties.** *For. Bull. Tenn. Valley Auth.* No. 3, 1941. pp. 155.

09.4 (75.6–8 : 76.1–2 : 76.8–9) : 97.1 : 12.19.2 : 98.1. **Forestry data for the Tennessee Valley. Part II. Area data for major drainage basins.** *For. Bull. Tenn. Valley Auth.* No. 4, 1941. pp. 39.

09.4 (75.6–8 : 76.1–2 : 76.8–9) : 97 : 94. **Forestry data for the Tennessee Valley. Part III. Forest areas by states and counties and types of ownership.** *For. Bull. Tenn. Valley Auth.* No. 5, 1942. pp. 25.

Most of the data contained in these booklets was collected during a survey of forest resources and industries in the Tennessee Valley by the Forest Resources Division, but information from other related economic investigations is also included. In Part I the major land classifications, major land uses, and timber-producing areas (classified by forest types and conditions) are tabulated for each county in the states of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia, which is wholly or partly within the boundary of the Tennessee River Basin.

In Part II three tables are given for each of the 28 major drainage areas of the Tennessee Valley, each containing data similar to that given in the tables in Part I.

The data contained in Part III indicate the significance of the farm woodland problem and the extent of public and private ownership in counties within the Tennessee Valley.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. *Atmosphere*

11.14. Precipitations. Evaporation. Humidity

11.14 : 07.7. HAYES, G. L. **A discussion of hygrographs.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 25, 1942. pp. 6.

11.2. *Climate*

11.21 : 91.3. WARREN, W. D. M. **Studies in climatic change. I, II. Amelioration, by contour trenching arid hill forest slopes.** *Indian For.* 68, 1942 (422–9, 472–9 + plate).

A silvicultural experiment, first begun in 1933 near Bambiaburu in the Kolhan Forest Division, Chota Nagpur Hills, Bihar, involving the contour trenching of a poorly forested area in a dry valley, appears to have resulted in local climatic improvement up to a distance of about 16 miles outside the irrigated area.

Climatic data for 1936–39 for the four rainfall-recording stations nearest to the experiment (Sonua, Goilkera, Chakradharpur, and Chaibassa) are examined and discussed, and are compared with figures available for the previous four-year climatic cycle, 1932–35. Comparisons for Sonua, which lies about 6 miles north of the nearest point of the irrigation system, show that the average rainfall increased from 48·60 in. in 1932–35 to 59·77 in. in the 1936–39 cycle. None of the gains occurred within the monsoon period, improvement being most marked in May, June and October. The total number of rainy days was also greater. Data from Chakradharpur and Chaibassa showed a similar, though less pronounced, effect. Data from Goilkera showed a slight decrease in rainfall over the 4-year period with some improvement in distribution. Although the data presented are not regarded as conclusive, it is emphasized that the experiment has successfully survived a full climatic cycle.

11.4. *Soil*

11.42. Soil Chemistry

11.42.34 : 11.48.1. GALLAGHER, P. H. **The mobile colloidal humus of podsolic soils and its relationship to the process of podsolisation.** *Proc. roy. Irish Acad.* 48, Sect. B, 1942 (213–29). [University College, Dublin.] O.R.S.

The brown colloidal humus of the podsol B horizon was isolated in a virtually ash-free condition by means of simple operations which are described. Observations were made on the behaviour of this material. Its possible relationships to peat and to the process of podsolisation are discussed.

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 11.47.3 : 21.3 : 12.25. MCCOMB, A. L. **Mycorrhizae and phosphorus nutrition of Pine seedlings in a**

prairie soil nursery. *Res. Bull. Ia. agric. Exp. Sta.* No. 314, 1943 (581–612).

At a new forest-tree nursery established on O'Neil sandy loam soil Pine seedlings failed to grow unless they developed mycorrhizae. Formation of mycorrhizae and satisfactory growth followed inoculation of the nursery soil with duff and humus from a healthy Pine plantation.

Comparison of mycorrhizal and non-mycorrhizal Virginia Pine seedlings revealed that plants with mycorrhizae had much larger root systems and more and larger absorbing root tips than plants without mycorrhizae. Infection with mycorrhizal fungi increased rather than retarded growth of short roots. Similarly, chemical analyses of the seedlings showed that mycorrhizal seedlings contained four times as much phosphorus as non-mycorrhizal plants. On a percentage dry weight basis mycorrhizal plants absorbed twice as much phosphorus, and there was no difference in the absorption of nitrogen and potassium.

Fertilizer experiments using Jack Pine and other species of conifers on uninoculated soil showed that good growth followed phosphorus fertilization, while little or no response was obtained with nitrogen. Seedling growth following phosphorus fertilization was approximately equal to that obtained when unfertilized soil was inoculated with humus containing mycorrhizal material.

Short roots of fertilized White Pine seedlings from uninoculated soil were mycorrhizae of the ectotrophic type and possessed a very compact mantle composed of fine mycelia. Short roots from seedlings on inoculated unfertilized soil were usually ectendotrophic mycorrhizae with coarse hyphal threads. Two species of fungi may be involved in the formation of mycorrhizae on White Pine, one of which may have been subdominant in the original nursery soil and incapable of forming mycorrhizae without phosphorus fertilization. Because of a compact mantle and fine hyphae the mycorrhizal nature of many short roots could not be determined without sectioning.

Jack Pine was found to be mycorrhizal and to make satisfactory growth when grown on two forest soils taken from Oak–Hickory stands. This species failed completely when grown in an alkaline prairie soil of the Webster series.

Factors possibly of importance in the phosphorus nutrition of Pine are discussed. It is suggested that failure of non-mycorrhizal Pines on O'Neil soil may be due to a low level of root respiration, and that root respiration and activity may be stimulated by secretions from mycorrhizal fungi and by phosphorus. *Author's summary.* [Cf. *For. Abstr.* 5 (111).]

11.43.2 : 11.44. Lindquist, B. **Influence of certain land molluscs in the decomposition of forest detritus.** *Kgl. Fysiograf. Sällskap. Lund., Förh. 1941* 11, 1942 (144–56). [G.] Chem. Abstr. 37 (2502). P.R.

The action of 9 species of snails and 4 species of slugs in consuming leaves of 9 species of forest trees was studied in relation to the formation of forest humus, and the results correlated with the chemical composition of the leaves.

11.43.2 : 11.44 : 12.26–8. Lyford, W. H. **The palatability of freshly fallen forest tree leaves to millipeds.** *Ecology* 24, 1943 (252–61). [U.S.D.A. Bureau of Plant Industry.]

It appears that the average palatability of leaves to the common brown milliped (*Diploiulus londonensis caeruleocintus* (Wood)) is often directly related to the average percentage of calcium in the leaves, although other factors, such as the proportion of lignin and cutin, and the general organic structure of the leaves, are no doubt also involved. The relationship between the average palatability and the ash content of the leaves is not significant. Soil differences appeared to have little effect. The palatability of some tree species can be judged from the following figures based on the area (sq. mm.) of leaf eaten per night by millipeds collected on Hermon sandy loam:—Yellow Birch (4·4–4·7 sq. mm.), Ash (3·6–4·3), Large-toothed Aspen (3·1), Red Maple (2·0–2·5), Sugar Maple (0·7–1·5), Paper Birch (1·2), Grey Birch (0·6), Red Oak (0·0–0·3), and Beech (0·0).

11.44. Litter. Surface Humus

11.44 (77.1) : 11.41 : 11.42. Gysel, L. W. **The forest humus layers of Ohio.** *Abs. Doctoral Diss. Ohio St. Univ.* No. 38, 1942 (167–75). E.S.R. 88 (597).

The more important forest humus layers of Ohio are classified and described and their physical and chemical properties are given.

11.44 : 43.3 : 12.25. Donahue, R. L. **Relation between the carbon content of soils under burning and non-burning.** *Proc. annu. Convent. Ass. sth. agric. Workers* 43, 1942 (71). Chem. Abstr. 37 (1818). P.R.

The total organic matter (including leaf litter) of soils under Shortleaf Pine and Longleaf Pine stands was 2–3 times as great in the unburned as in the burned plots. Of the incorporated organic matter, however, more was found in the burned areas. In general, burning destroyed most organic matter when done in the summer and least when done in the spring.

11.47. Maintenance of Favourable Soil Conditions

11.47.13 : 11.42.31 : 12.25 : 56.02 : 21.32. Pronchenko, V. F. Rezultatȳ desyatiletnego opȳta s izvestkovaniem v elovom nasazhdenii. **[The results of a ten years' liming experiment in a Spruce plantation.]** *Pedology* No. 3–4, 1942 (42–53). [Russ.e.] L.S.

The experiment described was conducted in the Moscow region during 1930–39 in a first-quality *Piceetum oxalidosum* stand planted in 1870–71. Liming resulted in a reduction in the acidity of the soil which had previously been very high; in an increase in mobile Ca, P_2O_5, and N; in the appearance of a thick undergrowth of Red Alder, and of vegetation indicative of a rich soil; and in improved diameter growth in the Spruce stand.

11.47.13 : 12.25 : 56 : 21.32 : 23.26.4. Němec, A., and Borisov, S. **The effect of various potash fertilizer materials on the growth and nutrition of Norway Spruce in forest-tree nurseries.** *Bodenk. PflErnähr.* 25, 1941 (323–45). *Chem. Zbl.* 1, 1942 (1041). Chem. Abstr. 37 (3217). P.R.

The action of different potash carriers on the growth and absorption of nutrients by Spruce in nurseries was investigated. Cl-free, sulphate-bearing potash carriers, on soils rich in lime but poor in K and P, influenced the growth favourably. Fertilization with large applications of 40-per-cent. potash fertilizer salts caused death or growth reduction. Although fertilization with sulphate-bearing potash salts on a soil with high

exchange acidity gave no noticeable increase in the rate of height growth it resulted in denser needle formation and darker colour of the needles. In this case also fertilization with large doses of 40-per-cent. potash salt caused the trees to die. The unfavourable action of large doses of 40-per-cent. potash salt was traced to the flooding of the needles and stems with Cl ions which was accentuated by moisture deficiency in the soil. Cl-free fertilizers containing K_2SO_4 were successfully used in large applications.

11.47.13 : 12.25 : 42.5 : 56 : 21.32 : 23.26.4. LUDBROOK, W. V. **Fertilizer trials in southern New South Wales Pine plantations.** *J. Coun. sci. industr. Res. Aust.* 15, 1942 (307–14). [Division of Plant Industry, C.S.I.R., Australia.] O.R.S.

Work begun as part of an investigation of needle-fusion disease of *Pinus* species was extended to include a study of the effect of phosphatic fertilizers on the growth-rate of all treated trees, whether affected with needle fusion or not. Boron compounds resulted in a quick but temporary diminution of needle-fusion symptoms in the first year, but subsequently boron treatments proved useless or detrimental. In one plantation superphosphate had practically no effect during the first season after application, but resulted in the gradual recovery of most of the affected trees (*Pinus caribaea* and *P. taeda*) during the next three seasons. In another plantation treatment of *P. taeda* with 2½ cwt. of superphosphate per acre was quite ineffective, possibly because of drought. Treatment with 1½ or 3 cwt. of superphosphate per acre had practically no effect on 7-, 9-, or 17- year-old *P. radiata* during three seasons after application. The same treatments, however, produced 35 per cent. increase in height growth, as compared with controls, in 1-year-old self-sown seedlings, during the first season after application. This was maintained during the next season in the plots treated with 3 cwt. of superphosphate, but not in those treated with 1½ cwt.

While it was evident that under certain conditions the application of phosphatic fertilizers greatly stimulated growth, results were extremely variable. The economic value of such treatment must remain uncertain until it has been shown that the beneficial effects extend over a period sufficiently long to be profitable, and until the effect of phosphatic fertilizers under normal moisture conditions can be observed.

11.49. Soil Types

11.49.2 (47.6) : 11.47. SAMBUR, G. N., BABICH, P. D., and KHOMENKO, K. A. **Chemical melioration of the salty soils of the forest steppes of the Ukrainian S.S.R.** *Chemisation Socialistic Agr. U.S.S.R.* 9 (9), 1940 (3–12). *Chem. Zbl.* 1, 1941 (1592). Chem. Abstr. 37 (2861). P.R.

Treatment with gypsum was shown to be suitable for the melioration of solonetz and solonchak soils. On slightly alkaline soils the effect was apparent after only a year; on more strongly alkaline soils only after 2–4 years. A dosage of 3–4 metric tons per ha. is recommended for the solonchak soils of the northern forest steppes and for the solonetz and solonchak soils of the middle forest steppes, and one of 20–25 metric tons per ha. for the solonetz soils of the southern forest steppes. The chernozems underlying the solonetz formation can be improved by the use of organic fertilizer or acid mineral fertilizer.

11.49.6. MACKAY, J. H. **What is laterite?** *Farm and Forest* 4, 1943 (10–5).

The author reviews briefly some of the recent literature concerned with the process of laterization and emphasizes the need for further study of this subject as a basis for sound planning of land use in the tropics.

11.49.6 (66.9). JONES, B. **Lateritic ironstone in Sokoto Province.** *Farm and Forest* 4, 1943 (15–23).

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 (78 : 79). UNITED STATES. **Reclamation handbook: A compendium of information on the reasons for and the development, operations, and results of conserving water and reclaiming land in the western United States.** *Conserv. Bull. U.S. Dep. Int.* No. 32, 1942. pp. vi + 99 + tbl. + map.

11.62.11 (76.6) : 97.3 : 34.21. ELWELL, H. M. **Progress report of land reclamation and pasture investigations on abandoned and scrubby Oak areas in central Oklahoma.** *Mimeo. Circ. Okla. agric. Exp. Sta.* No. M–86, 1942. pp. 9.

Investigations undertaken on an area of eroded and scrub land in Oklahoma showed that native grass alone is slightly more effective than a mixture of grass and Oak scrub (*Quercus marilandica* and *Q. stellata*) in preventing soil and water losses. After removing brush and timber from the scrub portion of the area good results were obtained in controlling hardwood sprouts by mowing them in the middle of May and again in August.

11.62.11 (77.7) : 23.21 : 21.1–2. AIKMAN, J. M., and BOYD, I. L. **Adaptation studies of plants for soil conservation purposes in southern Iowa.** *Proc. Iowa Acad. Sci., 1941* 48, 1941 (117–21). [Iowa State College, Ames, Iowa.] A.P.B.

In order to study the effect of micro-climate on plant adaptation, replicated plantings were made in 1938 of 32 potential hillculture trees and shrubs at the field station near Floris, Iowa. The sites were selected on eroded east- and west-facing slopes, 400 yards apart, with soil of the Lindley type (top soil 4–6 in.), on abandoned fields which had been left to recover for roughly the same length of time. Planting stock averaged only about C grade, and no special attempt was made to save the plants. While several varieties of *Prunus americana* and other species of *Prunus* grew almost as well on the west as on the east slope, in general the plants that became established gave a higher rate of survival and more satisfactory growth on the east slope. Meteorological stations established on north, east, south and west slopes of approximately the same degree and protection have shown that the individual climatic factors which seem to have most effect on the establishment and growth of plants are temperature, humidity, and wind velocity. During the first season of establishment high winds doubtless accounted for the failure of many of the unprotected seedlings on the western slope.

11.62.11 (79.5) : 23.21. MCLAUGHLIN, W. T., and BROWN, R. L. **Controlling coastal sand dunes in the Pacific Northwest.** *Circ. U.S. Dep. Agric.* No. 660, 1942. pp. 46.

An account of methods employed by the Soil Conservation Service in arresting sand dunes at the mouth of the Columbia River, Oregon. It was recognized

that generally a mantle of protective vegetation develops rapidly enough to keep pace with the normal dune-building processes, and that even where mechanical devices are used to arrest sand movement temporarily, vegetal control must be established where permanent reclamation is desired. The first stage in reclamation is the planting of sand-binding beachgrass, but final control requires the use of shrubs and trees, which may be introduced only after the initial stabilization has been accomplished. Scotch Broom (*Cytisus scoparius* (L.) Link) is the shrub most commonly employed for this purpose. The only native tree species used extensively in dune-control plantings is Shore Pine (*Pinus contorta* Loud.). The Pine is usually planted towards the inside of the dune where greatest height is needed, the Broom being planted on the outside where there is no heavy shade. Being a legume, the Broom builds up the nitrogen content of the soil while acting as a windbreak for the young Pines. Other trees used in the later stages of dune-reclamation include the introduced species *Pinus pinaster*, *P. sylvestris*, *P. pungens*, *P. nigra*, and *Alnus glutinosa*.

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11.1. *Metabolism. Plant Constituents. Sap Flow. Growth Substances. Reserve Materials*

12.11.1 : 07.7. Goodwin, C. W., Nims, L. F., and Parr, T. **A portable vacuum-tube millivoltmeter.** *J. For.* 41, 1943 (414–6).

A detailed description is given of a portable vacuum-tube millivoltmeter which has proved practicable for field use in measuring voltage gradients in trees.

12.11.11 : 12.14.5 : 12.26–8. Olsen, C. **Chlorophyll content of Beech leaves (*Fagus sylvatica*) exposed to light and shade.** *C.R. Lab. Carlsberg* (*Sér. chim.*) 24, 1942 (99–103). Chem. Abstr. 37 (3127). P.R.

The chlorophyll content of Beech leaves depends on the area of leaf surface but not on the dry weight. Per unit of surface the chlorophyll content is higher in leaves exposed to light than in those that are shaded. But in both cases the chlorophyll content of the leaves increases from the time of their first appearance until the middle of June and then remains constant until the autumnal change of coloration.

12.11.11 : 12.14.5 : 12.26–8. New York State. **Cornell University Agricultural Experiment Station. Fifty-fifth annual report, 1942.** Ithaca, New York. [1942?]. pp. 192.

Differences in the mineral nutrient content of leaves on various parts of a single Sugar Maple tree were found to be relatively small in comparison with differences between trees on various sites (p. 136).

12.11.11 : 12.14.5 : 12.26–8. Liozin, M. F., and Vyacheslovskaya, D. I. **Iron and silicon in *Morus alba* L. leaves.** *Uchenye Zapiski Moskov. Gosudarst. Pedagog. Inst.* 21, 4, 1940 (101–10). [Russ.] *Khim. Referat. Zhur.* 4 (1), 1941 (62–3). Chem. Abstr. 37 (1739). P.R.

The content of Fe in *Morus alba* L. leaves, expressed in percentage of the absolute dry substance, decreased in most cases toward the end of the vegetation period. The content of Si increased in the second half of summer, depending to a great degree on the locality of growth (Mirgorod 0·360–0·935, Fergan 0·734–3·983 and Pyatigorsk 2·186–2·866 per cent.).

12.11.11 : 12.14.7 : 12.26–8. Ruzicka, L., Janett, W., and Rey, E. **Triterpenes. LXXII. Aescigenin, the aglucon of the saponin from the seeds of the Horse Chestnut (*Aesculus hippocastanum* L.).** *Helv. chim. Acta* 25, 1942 (1665–73). Brit. chem. physiol. Abstr. AII 1943 (169). P.R.

12.11.11 : 12.14.7 : 12.26–8. Clark, E. P. **The occurrence of rotenone and related substances in the seed of the Berebera tree. A procedure for the separation of deguelin and tephrosin.** *J. Amer. chem. Soc.* 65 (1), 1943 (27–9). O.R.S.

Rotenone, dehydrorotenone, tephrosin, and two new compounds have been isolated from the seeds of the African Berebera tree (*Millettia ferruginea*).

12.11.11 : 12.14.7 : 12.26–8. Schechter, M. S., and Haller, H. L. **The insecticidal principle in the fruit of the Amur Corktree [*Phellodendron amurense*.]** *J. organ. Chem.* 8, 1943 (194–7). L.S.

12.11.11 : 12.14.8 : 12.26–8. Lemesle, R. **A complex tannin-resin-protein substance in the bark of *Drimys winteri*.** *Compt. rend.* 214, 1942 (237–8). [F.] Chem. Abstr. 37 (2772). P.R.

Sections from young stems of *Drimys winteri* contain both ellagic acid and gallotannic acid. They are soluble in EtOH. In fragments of aged stems and bark, however, the acids are present in a complex form, which is insoluble in EtOH, water or alkali, and which contains protein and resin.

12.11.11 : 12.21 : 44.3 : 12.25. Smits, B. L., and Peterson, W. J. **Carotenoids of telial galls of *Gymnosporangium juniperi-virginianae*, Lk.** *Science* 96 (*n.s.*) 1942 (210–1). [Department of Chemistry, Kansas State College.] L.S.

In an investigation of the pigments of the telial galls of the common rust fungus *Gymnosporangium juniperi-virginianae* Lk. β- and γ-carotenes were shown to be the only carotenoids present, with the γ-isomer predominating. The identification of γ-carotene was based on its more characteristic properties, behaviour on an adsorbent, and its absorption spectra. Neither free nor esterified xanthophylls were present, and only traces of chlorophyll.

The leaves of the Juniper (*Juniperus virginiana*), besides containing chlorophyll, showed the presence of α-, β-, and γ-carotene. *Authors' summary.*

12.11.12 : 21.11 : 12.25 : 12.26–8. Kramer, P. J., and Decker, J. P. **The effect of light intensity on photosynthesis in Pine and Oak seedlings.** *Abstr.* in *J. Elisha Mitchell sci. Soc.* 58, 1942 (134). L.S.

The rates of photosynthesis of potted seedlings of Loblolly Pine (*Pinus taeda* L.) and Eastern Red Oak (*Quercus borealis* var. *maxima*) were measured at 7 light intensities ranging from 300 to 9,300 ft.-candles, the air temperature being maintained at 25° C. The apparent photosynthesis was measured in terms of absorption of carbon dioxide by the entire shoot. Photosynthesis of Oak seedlings was at a maximum at about 3,300 ft.-candles, and decreased slightly at higher intensities. Photosynthesis of Pine seedlings increased with light intensity up to the highest light intensity used, 9,300 ft.-candles.

12.11.12 : 12.25 : 12.26–8 : 11.41.1. Kramer, P. J. **Species differences with respect to water absorption at low soil temperatures.** *Amer. J. Bot.* 29, 1942 (828–32). L.S.

An investigation was made of the effects of gradually cooling the soil on water absorption by certain plants, including Elm, and Red, White, Loblolly and Slash Pines. Absorption was reduced in all species, but more in species which normally grow in warm soil than in species which normally grow at least part of the year in cold soil.

Loblolly and Slash Pine absorbed only 40 per cent. as much water at 10° as at 25° C., while Red and White Pine absorbed 60 per cent. as much at 10° as at 25° C.

The differences between species are believed to result chiefly from differences with respect to the changes in viscosity and permeability of the protoplasm of the roots caused by low temperature. Reduction in water absorption caused by cold soil is of considerable ecological and practical importance, because it often produces winter injury and even affects the growth of plants in greenhouses. *From author's summary.*

12.11.12. EYSTER, H. C. **Osmosis and osmotic pressure.** *Bot. Rev.* 9, 1943 (311–24). [University of South Dakota.]

12.11.13 : 12.14.5 : 12.26–8 : 45.3 : 13.2. NEWCOMB, E. H. **A study of the respiration of the large Oak apple gall.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (15s). [University of Missouri, Columbia, Mo.] L.S.

Respiratory activity of galls produced by *Amphibolips confluens* on the leaves of Red Oak (*Quercus borealis* var. *maxima*) is compared with that of the normal leaf tissue.

12.11.14. WARNE, L. G. G. **The supply of water to transpiring leaves.** *Amer. J. Bot.* 29, 1942 (875–84). [Victoria University of Manchester.] L.S.

The paper discusses the resistances offered to water transport by the stem and root of a plant, and the mechanism by which these resistances are overcome. The specific conductivity was found to be higher for deciduous than for evergreen trees and shrubs. A low specific conductivity, however, may be more than counterbalanced by a large amount of conducting tissue or by a reduction in the transpiring surface. Conductivities of a number of species were determined and expressed on the basis of area of foliage to be supplied. Experiments failed to show that stem resistance offered any serious obstacle to the flow of water to the transpiring organs. As leaves of plants often wilt when subjected to conditions favouring high transpiration even when the roots have a good supply of water, it was evident, therefore, that other resistances to the flow of water to the foliage, more important than stem resistances, must be operative.

Data obtained from experiments to determine root resistance supported the view that, at least under conditions favouring a high rate of transpiration, the root system may act as a barrier to the flow of water from the soil to the transpiring leaves. Measurements of the rate at which liquid was exuded from the stump of a decapitated plant showed that this rate was usually less than that at which, under normal conditions, water is lost by an intact plant. The root system alone, therefore, does not usually exude sufficient liquid to cover the transpiration requirements of the plant.

Estimates were made of the tensions of the tracheal contents of intact plants. To ensure a supply of water sufficient for transpiration needs the contents of the tracheae must be under a considerable tension which, along with the presence in the tracheae of a solution which exerts osmotic pressure, may be responsible for the suction force when transpiration is active. This tension varies from species to species. The greater the suction force the less readily does water flow to the evaporating surface, and the more is the water at the evaporating surface withdrawn into the intermicellar space of the cell wall, thus greatly increasing the resistance to evaporation. In all the cases examined the osmotic pressure of the cell sap of the leaves exceeded the estimated tension of the tracheal contents. As tensions disappear during periods of good water supply and low transpiration, the existence of tension may indicate the adaptation of a plant to a slight water deficit.

12.11.15 : 12.21. FRIES, N. Über das Wuchsstoffbedürfnis einiger Ophiostoma-Arten. **[On the growth substance requirement of some *Ophiostoma* species.** *Svensk bot. Tidskr.* 36, 1942 (451–66). [G.] R.A.M. 22 (150).

Three species of *Ophiostoma*, viz. *O.* (or *Ceratostomella*) *ulmi* from Elm (a Dutch isolation), *O. coeruleum* (or *C. coerulea*), and *O.* (or *C.*) *stenoceras*, the two latter from ground wood pulp in Sweden, made only rudimentary growth on a synthetic aqueous medium containing glucose, ammonium chloride or tartrate, and inorganic salts, the assimilation of which was facilitated, however, by an admixture of minute quantities of malt or yeast extract. Attempts to replace these extracts by chemical substances gave the following results:—The addition of adermin (vitamin B_6) to the substratum at the rate of mγ per 25 cc. induced luxuriant mycelial growth in cultures of *C. ulmi*, while the other two species responded similarly to aneurin or pyrimidin, the effect of which was further strengthened by biotin and, in the case of *O. coeruleum*, by adermin.

12.11.15 : 12.11.22. MITCHELL, J. W., and RICE, R. R. **Plant-growth regulators.** *Misc. Publ. U.S. Dep. Agric.* No. 495, 1942. pp. 75. [U.S.D.A. Bureau of Plant Industry.]

Results from experiments on the effects of various chemicals and commercial preparations on root production by cuttings have been compiled from the literature for various groups of plants, including coniferous and broadleaved trees and shrubs. The information, so far as it is available, includes for each species:—month or season of collection of cuttings, treatment, time of rooting, and percentage rooted. Notes are included on the preparation and application of growth-regulating substances and on their possible future use.

12.11.2. *Propagation. Growth. Development*

12.11.21 : 12.25 : 23.23.1 : 23.26. AFANASIEV, M., and CRESS, M. **Producing seedlings of Eastern Red Cedar (*Juniperus virginiana* L.).** *Bull. Okla. agric. Exp. Sta.* No. B–256, 1942. pp. 21.

The authors report on a satisfactory method of handling seed of *Juniperus virginiana* and on some of the experimental work on which the method is based. Information is presented on the collecting, storing, cleaning and treatment of seed and on the growing of seedlings from after-ripened seed.

Delayed germination in seed of *J. virginiana* is caused by a dormant embryo; the seed requires stratification at low temperatures to complete after-ripening, the length of time required to complete this process

varying with the individual seed. For the material reported on, after-ripening was completed after 70 days at a temperature of 41° F. Drying of after-ripened seed caused reversion to a secondary dormancy which was overcome by stratification for a relatively short period.

Temperature had a marked effect on germination of after-ripened seed of *J. virginiana*, the optimum temperature being 50° F. with only a slight reduction in germination at 60° and 70° F. One year of storage of cleaned seed of *J. virginiana* at low temperature (41° F.) and of dry berries at room temperature (70°–90° F.) did not reduce the viability of the seed.

Germination was not affected markedly by the reaction of the medium when the pH of the latter varied between 4·4 and 8·4. The highest germination was obtained at a pH of 6·2.

12.11.22 : 12.25 : 21.2 : 12.11.15. FISHER, G. M. **Conifer propagation with mist.** *Amer. Nurserym.* 77 (8), 1943 (9–10).

The author describes a small-scale experiment on the propagation of 15 species or varieties of *Juniperus* and 3 of *Thuja* in a greenhouse equipped for mechanical humidification. A table records the best results for each variety, the rooting medium used, and whether or not cuttings were treated with a root-inducing substance. [Cf. *For. Abstr.* 5 (14).]

12.11.22 : 12.25 : 12.11.23. MIROV, N. T. **Can branch cuttings of conifers develop into straight trees?** *J. For.* 41, 1943 (369). [Institute of Forest Genetics, California Forest and Range Exp. Sta.]

The author has found that branch cuttings of some species of Pine do not develop into well-formed trees, although cuttings of species such as Monterey Pine (*Pinus radiata*) have grown vigorously to produce straight, symmetrical trees. The importance of finding out whether branch cuttings of various Pine species will develop satisfactorily is emphasized.

12.11.23 : 12.14.2 : 12.26–8. MAJUMDAR, G. P. **The sliding, gliding, symplastic or the intrusive growth of the cambium cells and their derivatives in higher vascular plants.** *J. Indian bot. Soc.* 20, 1941 (161–71 + plate). [Presidency College, Calcutta.] O.B.D.

From the data presented in this paper it appears that in the higher and highly specialized dicotyledons the elongation of the fibres during differentiation takes place by the intrusive growth of their ends between their neighbours.

12.11.23 : 12.14.4 : 12.25. FRIESNER, R. C. **Correlation of elongation in primary, secondary and tertiary axes of *Pinus strobus* and *P. resinosa*.** *Butler Univ. bot. Stud.* 6, 1943 (1–9). A.P.B.

Elongation in *Pinus strobus* and *P. resinosa* began at approximately the same time in all of the axes studied, regardless of position in the contour of the tree. The primary axis exhibited a greater total elongation and a higher daily rate of elongation than any secondary or tertiary axis in each of the 3 trees studied. Secondary axes exhibited successively shorter total elongation and lower daily rates from the topmost whorl of branches downward. Tertiary axes showed shorter total elongation and lower daily rates than secondary axes. Older secondary and tertiary axes showed less elongation than younger axes of the same type. *From author's summary.*

12.11.23 : 12.14.5 : 12.11.15. KRASNOSSELSKÁYA, T. A., and RICHTER, A. A. **Transport of break of winter dormancy of buds along branches of woody plants.** *C.R. Acad. Sci. U.R.S.S.* 35, 1942 (184–6). [E.] O.R.S.

Experiments described in this paper show that a warm-bath treatment of part of a dormant twig or shrub is effective in breaking the dormancy of buds on all parts of the branch, whether treated or not, and that this effect can be transmitted apically or basally from a treated portion. The causal factor or stimulus within the branch is shown to originate mainly in the buds and to be transported to the untreated parts by way of the branch wood; the bark also plays a certain part in the process. The material used in the experiments was mainly twigs of *Populus suaveolens* and *Fraxinus* sp.

12.11.23 : 12.14.7 : 12.25. ROSSBACH, G. B. **Development of a leafy axis upon the cones of a Tamarack.** *Rhodora* 45, 1943 (106–7). O.B.D.

A Tamarack (*Larix laricina*), 7 ft. tall, growing on a dry, open slope in the arboretum of the Wisconsin Experimental Game and Fur Farm to which it had been transplanted 4 or 5 years previously, was observed to bear a leafy axis upon many of its otherwise normal cones. A nearby Black Spruce (*Picea mariana*) developed leaves more than twice their normal length and it is not known whether the Tamarack is similarly exhibiting an inherent ability to respond to an unusual habitat.

12.11.23 : 12.2. BLOCH, R. **Polarity in plants.** *Bot. Rev.* 9, 1943 (261–310). [Yale University.]

The term 'polarity' generally designates an internal asymmetrical state existing in a living organism or a situation where two ends or surfaces in a living system are different. Polarity is often visible as morphological differentiation, but it may also be expressed in the differential behaviour of cells, tissues, or organs, as in their reaction to certain stimuli. The present paper reviews the main facts concerning the phenomena of polarity and describes experimental modifications of polarity in various types of plants: slime moulds, algae, bryophytes, pteridophytes, and phanerogams. On the basis of evidence from various sources it appears that orientation or re-orientation of the individual cytoplasm is possible, at least in a number of representative cases. Some influence on the polarity of unicellular forms and of individual vegetative cells in multicellular structures appears to be exercised in certain cases by such external factors as light, gravity, and the presence of water, but in differentiated and specialized plant forms attempts to change the polarity of the complete structure have met with little success. Various theories on possible causes of polarity are outlined and discussed.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3 : 05.3 (485) : 12.11.22 : 12.11.15 : 31.1 : 31.3 : 12.25 : 12.26–8. SWEDEN. Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under år 1941. [**Annual report on the work of the Association for Breeding of Forest Trees during 1941.**] *Svensk PappTidn.* 45, 1942 (300–7, 324–7, 382–3, 404–9, 519–22, 542–3). [Sw.] P.O.

In spite of difficulties in Sweden regarding staff, a considerable amount of research was successfully carried through and collaboration with various state, semi-official, commercial and other bodies (including Lund University Institute for Genetics, the Ramlösa

Plant Nursery at Hülsingborg and the State Railway Department) was maintained.

In the spring of 1941 the 'Society for the Promotion of Forest Tree Improvement' (Sällskapet Skogsträdförädlingens främjande) was formed with the object of co-operating with the Association for Forest Tree Breeding. B. Lindquist was appointed director. The new Society has been in the first instance concerned with Pine and Spruce—selection of élite trees and collection of seed from fellings of élite stands and from plantations grown from mother plants selected by Lindquist.

Research at the main Institute and the branch stations in 1941 has included the improvement of conifers, Pine and Norway Spruce receiving special attention.

The experiments started in 1939 with selected nursery material of Pine types were continued and some new sowings of seed from different selected mother trees or from other potentially valuable types were made at Ekebo, Dalfors, and Backe. Extensive seed collection of Pine and Spruce was organized and Spruce plantings were made at Ekebo. Seed was obtained mainly from Central Sweden and Norrland except for that from a few pedigree specimens in Skåne.

Seed from numerous selected mother trees of Spruce from various parts was collected for progeny tests. In Skåne (at Knutstorp and Wrams-Gunnarstorp) an abundant supply of cones was obtained from over 200 mother trees mainly of the 'comb'* Spruce type.

'Comb' Spruce seed was gathered from the Stenbackerna experimental plantation at Wrams-Gunnarstoop and also from élite trees in the high-grade artificial stands at Boserup. In Halland several élite Spruces were chosen as mother trees in the 'German' Spruce stands previously examined at Hjuleberg and other places.

Observations on the growth of Spruce of various branching types, regenerated in southern Sweden, have been amplified by similar observations in natural stands in central Sweden. Analysis of the data for various districts on the basis of age classes indicated clearly the superiority of the 'comb' Spruce type as regards height and diameter at breast height.

Work on propagation by cuttings now covers, not only Spruce, but also selected mother trees of Pine and Larch; and the possibility is being explored of using this method of propagation on a wide scale for desirable variants of improved types of the most important Swedish conifers.

Hormone treatment has given successful results in the propagation of greenwood cuttings of Birch and Beech and of root cuttings of Aspen.

Bottle grafting too (so successful with Birch) has now been tried with Pine and Spruce, using branches bearing flower buds of (1) northern and central Swedish élite Pines, some narrow-crowned and some with broad crowns, (2) élite 'comb' Spruce of the 'German' and Swedish type, and (3) Spruce of still another variation in branching habit, for use in crossing with 'comb' Spruce and *inter se*. Though not entirely successful, these grafts provided valuable information on the proper technique, which will be put into practice on a large scale in 1942. Since the appointment of a special director for research on conifers, colchicine experiments on Pine and Spruce and Larch have been undertaken.

* 'Comb' Spruce = Kamgran, i.e. a Norway Spruce with fine drooping branches.

Arising out of the Larch survey started in 1940, a preliminary chemical study of the timber of *Larix decidua* (*europaea*), *L. kurilensis*, *L. leptolepis* and *L. sibirica* has been carried out.

Work on Aspen and other Poplars is recorded as follows by H. Johnsson:—

During 1941, hybridization of Aspens and of Poplars continued with special attention to potentially valuable plant material. Material from central Sweden only was used in the Aspen crosses. European Aspens were crossed with the North American species *Populus tremuloides* and *P. alba*, the former cross appearing particularly promising.

In the Poplar crosses mainly the Black and the Balsam Poplars were used, and vigorous growing types are expected from the hybrids now being raised, *P. nigra* × *P. laurifolia* having shown specially good increment rate. From the North American material about 10 named varieties have been produced and these were transferred to Ekebo for their first tests under Swedish conditions. These varieties show remarkable growth but are probably not sufficiently hardy for the climate.

In connexion with Aspen improvement through polyploidy, a method is being sought of inducing flowering in young high-chromosome plants, and young Aspens have been grafted in the crown of old trees in process of fruiting.

From Birch seed collected in 1940 about 160,000 seedlings were raised for research in 1942 and though Birch seed was scarce in 1941, collections were made in northern and central Sweden by the affiliated stations.

Using the bottle-grafting method about 50 different crosses were made, most of which gave a good yield of seed. The series included some 'Grey Birch'* crosses made with the object of producing a uniform Grey Birch race; some *Betula verrucosa* crosses made with the object of obtaining a race of trees producing a timber characterized by the figure typical of this species; and finally, some crosses made to determine whether it is possible to obtain rapid-growing races of Birch as in the Poplar. These crosses included the native Birches, *Betula verrucosa* and *B. pubescens*, the N. American species, *B. papyrifera*, and the Asiatic species, *B. japonica*.

A small number of plot experiments specially devoted to American Birches imported by Prof. G. Turesson were laid out at various centres.

In an attempt to induce flowering and seed setting in young Birches, grafting of young Birch plants in the crown of older individuals was tried.

Most of the 1941 Beech mast was collected from various stands in Skåne, though other localities including Gullmarsberg, which is exceptionally far north for the Beech, contributed a part of the seed.

Some Beeches of particular promise have been selected for propagation by hormone treated greenwood cuttings with a view primarily to seed production, and high-grade progeny is expected to be obtained.

Carin Eklundh gives the following report on Elder, Ash and Elm:—

From 16 different stands in southern and central Sweden 102 lots of seedlings have been raised and are to undergo comparison trials in 1943.

The progeny of species crosses made in 1940 have shown great variation in size, habit, etc., both

*Gråbjörk in the text, i.e. *Betula pubescens* (Ehrh.) Gunnarss.

between and within the different lots, but it is still too early to decide whether heterosis is operating and whether definitely superior characteristics are present in some of the crosses.

Crosses were made using either *Alnus glutinosa* or *A. cordata* as the female parent and *A. subcordata* and others as the pollen parent. The seed obtained is to be sown in the greenhouse at Ekebo.

Chromosome studies of seedlings treated with colchicine revealed mainly a simple diploid constitution, though there were a few mixoploids containing root cells with 28 and 56 chromosomes. The latter forms are to be propagated vegetatively.

A survey was made of Alder stands in Halland, Västergötland, Östergötland, Södermanland and Småland and the mother trees chosen in the previous year have been more closely studied. About 50 bottle grafts of Ash have been made in the greenhouse at Ekebo, using branches from mother trees from élite stands on stocks of 2-year-old specimens of *Fraxinus americana* grown in pots. Unfortunately the crosses planned could not be made owing to the slow growth of the flower buds, though the vegetative buds grew rapidly. The grafts, however, gave 100 per cent. success, and as many of the plants developed flower buds during the summer, species crosses are to be tried again in 1942.

Ash cuttings planted on a small scale in the greenhouse in July failed to develop roots during the summer, but they remained fresh, and active callus formation occurred. Cuttings of annual shoots from older wood seemed to have a stronger tendency to callus formation.

The set of seed in 1940 and 1941 was poor in many localities, most of the Ashes selected as mother trees giving none. The small quantity collected was to be sown in the following spring.

Seedlings have been planted out from Prof. Turesson's North American collection and the foreign seedlings that are being grown now include Oak, Ash, Birch, Alder and Elm.

The chemical laboratory at Ekebo has been engaged on examinations of the timber from diploid and triploid Aspens from both Skåne and Västerbotten. Cell measurements of sections and macerated preparations of the wood indicated that the triploids had all larger cells than the diploids and also had higher values for cellulose content, though it is possible that these results may be due not to a really higher cellulose content but to the analytical technique employed.

Numerous fibre measurements were made on conifers and deciduous trees mainly to find out from what part of the stem samples must be taken, if comparable values are to be obtained. Similar work was done by E. Runquist on timber from the Grey and the 'glass'* Birch.

Preliminary investigations were begun on variation in the content of tanning substance in the Oak.

Some analyses of woods from *Larix sibirica*, *L. leptolepis*, *L. decidua* and *L. kurilensis* were made and differences in the chemical composition of the species were recorded.

Studies of nectar secretion in Willows, Maples and Limes revealed constant individual differences in the amount of nectar produced.

Experiments were completed at the low-temperature laboratory on Oak, Beech and Ash with reference to coloration or fall of the leaf at various autumn stages.

E. Runquist reports as follows on the work of the affiliated branch institutions in Norrland:—

Seed collected for the study of heritable variation and stand analysis in the Pine has been sown at Bosundet in Angermanland. Germination studies of Pine and Spruce have been continued and the development of the seedlings obtained is being observed.

In Värmland, Dalarna, Angermanland and Västerbotten material taken from selected Pines from Professor Turesson's collection is to be used for grafts and cuttings which may ultimately be used for crosses of various kinds.

Some comparable data collected in the now 5-year-old trees in the Pine progeny trials indicated that there were differences in the rate of growth.

Experiments on the pruning of cultivated Pines from southern Sweden are in progress at Ljusne. Expeditions were made in various parts of Sweden to record various forest-tree types and to revise the collection belonging to the Kramfors Atiebolag.

Special attention is being given to Norway Spruce and the collection of seed from valuable types such as the 'comb' Spruce. From specially vigorous 'comb' and 'brush' Spruces, branches were taken at various periods during the autumn for experiments on cuttings.

A new 'strangulation' experiment on terrain with unsatisfactory natural regeneration was made on 91 young Spruces and 3 Pines in Dorotea and another on about 20 older Pines in the experimental wood at Dalfors. The strangulation of young Aspens in 1940 has given indications of positive results even though there has been no setting of flower buds as yet.

Aspen material from selected parents has been collected for hybridization and some Aspens of particularly good quality have been found in various districts and will be used at Ekebo in crosses.

Comparative observations on Birch are being carried out in Värmland, Dalarva and Västerbotten. Grafting material of 'glass' and Grey Birch as well as *Betula verrucosa* was collected from Västmanland, Umea and Södermanland.

In the Dalfors and Orsa region various Birch types have been selected for interspecific hybridization. Much attention is being given to quality, and selections of 'veneer' Birch (Fanérbjörk) for special purposes have been made in the first instance on the basis of purely botanical features. The descriptions prepared have been used as the basis for quality estimates in connexion with plywood manufacture in a factory at Ljusne.

Following up the work of the Norrland affiliated concerns, the Association began in 1941 an investigation of the wood quality of the northern and central Swedish Birch and a circular on a technique recommended in taking and sending in experimental samples has been sent to all investigators likely to collaborate in this study. In response to this request, much experimental material has been received at the forestry research centre at Stockholm and the chemical laboratory at Ekebo.

F. von Schantz reports as follows on the central Swedish branches of the Association:—

Selection of seed from promising phenotypes, including Pine (103 mother trees) and Norway Spruce (185 trees), was continued in a large number of localities, and at Ekebo about 33,500 Pine and 185,000

*Glasbjörk in text, i.e. *Betula pubescens suecica* Gunnarss.

Spruce seedlings have been raised for comparison trials.

The species of *Larix* situated at Grensholm in Östergötland were used in hybridization experiments and 40 different combinations, involving *L. decidua*, *L. leptolepsis*, *L. sibirica* (from Raivola and the Urals), *L. dahurica*, *L. koraiensis*, *L. kurilensis*, *L. principis rupprechtii* and *L. occidentalis*, were made, 160 cones being produced.

Hybridization of Pine was tried at Lunnaby but was only partially successful owing to the scanty flowering of the trees.

Many new experimental plantation plots, including some with American and Swedish Oaks, were laid out. A comparison trial of 5,000 American Pines begun at Strömserum with *Pinus resinosa*, *P. strobus*, *P. banksiana*, *P. ponderosa*, *P. contorta* and *P. silvestris* had to be concluded in 1942 owing to drought injury which affected the *P. resinosa* seedlings adversely. Minor provenance experiments were conducted at Strömserum, Lunnaby and Grensholm with *P. resinosa*, *P. monticola*, *P. strobus*, *P. contorta*, *P. banksiana*, *P. ponderosa* and *P. jeffreyi*.

Selected Pines and Spruces were chosen for vegetative propagation by grafts and cuttings.

Seeds was gathered from Birches selected the year before.

A resumé is given of publications issued and of lectures and tours, etc., undertaken during the year.

M. L. C. W.

12.11.3 : 8 : 23.23.12 : 05.3 (485). SYLVÉN, N. Föreningen för växtförädling av skogsträd. Styrelseberättelse för år 1942. **[The Association for Forest Tree Improvement. Report of the Board of Management for the year 1942.]** *Svensk PappTidn.* 46, 1943 (187–9). [Sw.] P.O.

This report (which contains the annual financial statement) deals with the resources of the Institute, including the administration of grants and other funds, problems of staff and the provision of buildings and equipment at various centres where forest-tree improvement is carried on.

Measures were taken to organize the future sale of improved types of trees, produced by the Association, and a special officer was appointed for this work. Seed collection on a large scale for marketing was also planned.

M. L. C. W.

12.11.3 : 12.25. EKLUNDH, C. Artkorsningar inom sl. *Abies*, *Pseudotsuga*, *Picea*, *Larix*, *Pinus* och *Chamaecyparis*, tillhörande fam. Pinaceae. **[Species crosses within the genera *Abies*, *Pseudotsuga*, *Picea*, *Larix*, *Pinus* and *Chamaecyparis*, belonging to the family Pinaceae.** *Svensk PappTidn.* 46, 1943 (55–61, 101–5 130–3). [Sw.] P.O.

In the first part of this article a brief but detailed and documented survey is given of Scandinavian and other records of natural or artificial interspecific hybrids within various genera of conifers. Tables are also included showing the results of crosses made at Kiviks Esperöd in Skåne and at Svalöf.

Picea glauca, belonging to section I (*Eupicea*), crosses readily with *P. sitchensis* and *P. engelmanni* of section II (*Casicta*) and the hybrid *P. notha* is derived from *P. glehnii* (section I) pollinated by *P. jezoensis* var. *hondoensis* (section II). Section III (*Omorica* Villk.), however appears to differ more from the other two sections and no cross between it and them has been recorded, though the results of some unsuccessful attempts at Kiviks Esperöd to cross *P. omorica* Purkyne with *P. obovata* Ledeb., *P. breweriana* S. Wats. or *P. asperata* Mast. are shown in the first of the above-mentioned tables. No final conclusion can, however, be drawn until more work has been done on this problem.

Apparently no [interspecific?] hybrids within the genus *Chamaecyparis* are known, though one of the tables shows that a few seeds germinated from interspecific crosses at Kiviks Esperöd.

Knowledge of chromosome numbers in conifers and the cytological basis of hybridization in the group is briefly reviewed. As regards the differences between the different genera and species in chromosome morphology and number, it seems that the factors determining generic differences are of a different nature from those operating in species formation. For example in the Abietinae the chromosomes within the genera are quite different morphologically, while between the species within a genus they show considerable similarity, and fully fertile natural hybrids occur. Since on the whole the species remain pure, there must be some factors (e.g. different areas of distribution, different times of flowering and marked genetical, anatomical and physiological differences) that prevent extensive hybridization.

The second and third parts of the article deal with results of experimental crosses within various genera of the Pinaceae.

Fifty-four crosses were made in *Abies*, *Picea*, *Pinus*, *Pseudotsuga* and *Chamaecyparis* at Kiviks Esperöd (Scania). To facilitate pollen collection branches with ♂ flowers were forced at a suitably low temperature in the greenhouse at the Ekebo Institute. The method of pollen storage and the technique of pollination are described in detail, with notes on the time when the ♂ and ♀ flowers of the various species were ready for use in hybridization. The *Picea*, *Pinus*, *Pseudotsuga* and *Abies* species and *Chamaecyparis lawsoniana* all gave abundant pollen but *C. obtusa* and *C. nootkatensis* gave little, partly owing to the fact that their ♂ flowers are so small, but also because they apparently are more affected by heat. The pollen varied greatly in quality as was borne out by the failure to give the staining reaction and the lack of uniformity in the shape and size of the grains. Of the 13 species tested, only *Picea mariana* and *P. sitchensis* gave 95–100 per cent. tolerably good pollen.

Full details of the crosses and their results are tabulated.*

From the 46 crosses within *Abies*, *Picea*, *Pseudotsuga* and *Chamaecyparis* 41 normal cones were produced. No difference was observed between cones from the artificially and the naturally pollinated trees.

Six *Abies*, two *Picea* and three *Chamaecyparis* crosses gave matured seed. The rest of the seed was empty though it exhibited no external differences from mature seed.

Details are given of the set of seed in various crosses and of the best methods of sowing and raising the seedlings.

The number of plants obtained from the crosses was small and at such an early stage it is impossible to decide whether the new combinations are superior to the parents or whether there is any heterosis; the mean increase in height of the progeny is on the whole

* In Table III in *Svensk PappTidn.* 46 (5), 1943.

equal to that of plants from open-pollinated seed. At 6 months the plants appeared frequently to be intermediate, with one parent species perhaps predominating in one character, and the other parent in another.

In the cross *Picea asperata* × *P. obovata* the buds are ovoidacute, as in the ♀ parent, but lack resin; the terminal bud has ridged, pointed hairy scales at the base as in *P. obovata*; the needles resemble those of *P. asperata*.

In *P. sitchensis* × *P. omorika* the buds resemble those of the maternal species with long subulate basal scales.

The hybrid *Abies sibirica* × *A. veitchii olivacea* resembles the maternal species but has darker buds and stiffer needles.

Some interspecific Larch hybrids are known to be definitely superior to the parent forms. The material used in the Larch crosses was a 20-year-old stand in the Svalöf park of the Association, comprising *Larix leptolepis*, *L. decidua*, *L. gmelini olgensis* and *L. gmelini japonica*, one older tree of *L. sibirica* nearby, and selected trees in the Larch plantation at Grensholm in Östergötland. In the Svalöf experiments isolation of ♀ flowers, pollen collection and pollination were carried out as described before and again buds had to be protected from damage by too high a temperature or intense sunshine.

In all, 10 crosses were made with *L. sibirica*, *L. leptolepis*, *L. decidua* and *L. gmelini japonica* as the ♀ parents and *L. sibirica*, *L. decidua* and *L. gmelini* as pollen parents.* Also, some branches were isolated for selfing. The cones of *L. leptolepis* ripened about 3 weeks later than the others. Seed was obtained from all the crosses except two, and seedlings were reared from the following 5 combinations.

(1) *L. sibirica* × *L. decidua* gave only two plants, both very vigorous.

(2) *L. leptolepis* × *L. decidua* is the much discussed hybrid between the Japanese and European Larches. The plants are intermediate and vary considerably in growth rate and vigour. The largest is 21·5 cm. tall.

(3) The four *L. leptolepis* × *L. gmelini japonica* plants average 12·5 cm., i.e. intermediate in height between the parents.

(4) *L. decidua* × *L. gmelini japonica* gave one strong seedling, 41·2 cm. tall, with light yellow-violet coloured branches and soft needles which are rounded on the upper surface and ridged beneath with 5–7 rows of stomata; the terminal buds are small, pointed and glaucus, the lateral ones, small, round, light brown and resinous.

(5) *L. leptolepis* × *L. sibirica* gave 2 seedlings, 24·8 and 5·8 cm. tall respectively, with yellowish-grey stems (as in *L. sibirica*), light green and very pointed needles, terminal buds rounded and with fimbriate, dark brown scales, and lateral buds large, ovoid, resinous and dark brown without the hairy ring round the needles found in *L. sibirica*.

At Grensholm *L. gmelini*, *L. gmelini olgensis*, *L. gmelini japonica*, *L. gmelini principes rupprechtii*, *L. decidua*, *L. sibirica* and *L. leptolepis* were used as ♀ parents and *L. gmelini*, *L. gmelini olgensis*, *L. decidua*, *L. sibirica* and *L. leptolepis* as ♂ parents. Though well grown and mature cones were obtained, the seeds were well developed but empty. Matured seed (92 seeds) was obtained only from the cross *L. gmelini japonica* × *L. decidua*. Two ripened and one germinated. Two species, *L. gmelini* and *L. gmelini principes rupprechtii*, when self-pollinated, gave full seeds. The percentage of mature seed in all 3 cases was very low and the 4 seeds set by *L. gmelini* failed to germinate. The sole plant from this lot of crosses resembled the ♀ parent *L. gmelini japonica* with dark violet stem and somewhat hairy branches.

*See Table II in *Svensk PappTidn.* 46 (3), 1943.

The importance of interspecific hybridization in forest-tree improvement is stressed in spite of its inherent difficulties. It is suggested that an ideal method in such work would be to have an arboretum of dwarf trees of the various species required which could be grown as bottle or other grafts or on their own roots and in which flowering could be induced by 'strangulation' planting in pots or buckets. Thus it would be possible to acquire a thorough knowledge of the breeding material and to plan further developments and test new crosses. Field experiments should also be conducted with the foreign species already in Swedish forests and parks, and their possibilities in different latitudes, climates and soils ascertained.

M. L. C. W.

12.11.3 (485) : 12.25. Föreningen för växtförädling av skogsträd. **[The Association for Forest Tree Improvement.]** *Svensk PappTidn.* 46, 1943 (137). [Sw.] P.O.

A report of a meeting.

The importance of the Larch in Swedish forest development will depend on the confirmation of the practical value of its timber and the fixing of suitable market prices. Selections should yield types well adapted to Swedish conditions.

To obtain forms adapted to central and southern Sweden, crosses between *Larix sibirica* and *L. europea* are recommended, while *L. dahurica* is thought to have considerable possibilities for the Norrland woods lying further inland at a higher altitude. Trees would be obtained from northern Siberia.

The Association is conducting large-scale work on the Larch. M. L. C. W.

12.11.3 : 12.26–8 : 21.0 (729.7). BEARD, J. S. **The importance of race in Teak, *Tectona grandis* L.** *Carib. For.* 4, 1943 (135–9). [E.sp.]

Teak has been raised in Trinidad from seed imported both from Southern India and Burma, seed from the latter source giving much the better growth under the prevailing conditions.

12.11.3 : 12.26–8. PANTULU, J. V. **Chromosome numbers of some Caesalpiniaceae.** *Curr. Sci.* 11, 1942 (152–3). [M.R. College, Vizianagram, S. India.] L.S.

The haploid chromosome numbers of 8 species belonging to 4 genera of the Caesalpiniaceae are recorded for the first time (with the exception of that of *Cassia siamea*). They are: *Bauhinia acuminata* Linn. (haploid chromosome number, 14), *B. purpurea* Linn. (14), *Parkinsonia aculeata* Linn. (14), *Caesalpinia bonducella* Flem. (12), *Cassia glauca* Lamk. (14), *Cassia glauca* Lamk. var. *suffruticosa* Koenig (28), *C. marginata* Roxb. (14), *C. siamea* Lamk. (14) and *C. obtusifolia* Linn. (13).

Morphological differences between *C. glauca* and *C. glauca* var. *suffruticosa*, as well as difference in chromosome numbers, seem to justify the raising of var. *suffruticosa* to specific rank. Also the separation of *C. obtusifolia* from *C. tora* can be supported by cytological evidence.

12.13. Embryology

12.13 : 12.26–8. KUMAR, L. S. S., and JOSHI, W. V. **False polyembryony in viviparous *Rhizophora mucronata* Lam.** *Curr. Sci.* 11, 1942 (242). [College of Agriculture, Poona.] L.S.

Examination of a specimen showing twin hypocotyls emerging from a single fruit of viviparous *Rhizophora mucronata* revealed that each of the hypocotyls was connected with its own separate plumule and enclosed by separate nucellar tissue, tegmen and other tissues of a distinct ovule. The two ovules were, however, adhering to each other.

12.14. Organography. Morphology. Anatomy. Histology

12.14 : 31.1 : 12.26–8. BAILEY, I. W. **Morphology and relationships of the Winteraceae.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (1s). [Harvard University, Cambridge, Mass.] L.S.

The Winteraceae are very homogeneous as regards the morphology of flowers, pollen, nodal anatomy, and wood structure. This family exhibits a combination of morphological characters that is indicative of relatively remote relationship to such ranalian families as the Magnoliaceae, Schizandraceae, and Trochodendraceae.

12.14.2 : 12.11.23. ESAU, K. **Origin and development of primary vascular tissues in seed plants.** *Bot. Rev.* 9, 1943 (125–206). [University of California.]

12.14.3 : 12.25 : 11.43.1. PRESTON, R. J. **Anatomical studies of the roots of juvenile Lodgepole Pine.** *Bot. Gaz.* 104, 1943 (443–8). [Colorado State College, Fort Collins, Colorado.] O.B.D.

Studies of the root system of *Pinus contorta* var. *latifolia* Engelm. showed that three main root types were distinguishable on the basis of structure and growth:—(1) the taproot, which was found to be tetrarch in its proximal portion, but more distally triarch, and thereafter diarch, (2) the lateral long-roots which were diarch throughout, and (3) the lateral short-roots, all of which were monarch.

Unlike the taproot and the lateral long-roots, the lateral short-roots were restricted in growth and nearly always formed ectotrophic mycorrhizae. Mycorrhizal sheaths were found over the tips of lateral long-roots during the period of dormancy, but the root tips burst through such sheaths when growth was resumed, and in no case did the long-roots seem to have their growth permanently interrupted by mycorrhizal development. Several instances were noted in which mycorrhizae appeared not to be strictly annual.

12.14.3 : 12.26–8 : 12.11.23 : 38.63 : 23.24 (54.5) : 23.22: 21.2. DEOGUN, P. N. **Relation between roots and method of irrigation in dry tracts of the Punjab.** *Indian For.* 69, 1943 (97–106 + plates).

The author contends that the method of shallow and repeated irrigation through 6 in.-deep trenches which was introduced as a measure of water economy in a number of plantations in the dry tracts of the Punjab is responsible for surface rooting in *Dalbergia sissoo*. Experiments have shown that deep irrigation a few times yearly, by which the soil is moistened to a considerable depth, encourages deep rooting and normally enables the tree roots to reach subsoil moisture.

12.14.4 : 12.24 : 12.11.23. FOSTER, A. S. **Zonal structure and growth of the shoot apex in *Microcycas calocoma* (Miq.) A. DC.** *Amer. J. Bot.* 30, 1943 (56–73). L.S.

12.14.4 : 12.25 : 12.11.23 : 12.11.15. GUNCKEL, J. E. **Certain dynamic aspects of shoot growth in Ginkgo.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (10s). [Harvard University, Cambridge, Mass.] L.S.

Ginkgo affords an excellent illustration of short shoot–long shoot relationships, in which either shoot expression is capable of change to the other. Such changes may occur normally, or may be induced artificially. Experimental evidence considered in the light of available information shows that:—(1) decapitation of the apical portion of any terminal or lateral branch results in the change to long shoots of a limited number of adjacent short shoots; (2) application of auxin to these cut surfaces will effectively inhibit the short shoots below. It seems, therefore, that variations in short shoot growth are directly referable to variations in the rate of auxin supply. The growth control of apical buds, whether as long or short shoots, is very complex. Several possible explanations are suggested:—(1) Apical bud expression may be dependent upon secondary inhibition from adjacent lateral branches. (2) Short shoots may have an increased rate of destruction of the auxin formed. (3) A deficiency, e.g. of nitrogen, associated with reduced auxin and also reduced vegetative growth may be limiting in short shoot growth. (4) Prolonged cold treatment, possibly with excessive dryness, releases short shoots from apical inhibition.

12.14.4 : 12.25 : 12.11.23 : 12.11.12. CRAFTS, A. S. **Vascular differentiation in the shoot apex of *Sequoia sempervirens*.** *Amer. J. Bot.* 30, 1943 (110–21). [University of California, Davis, Calif.] L.S.

Xylem differentiation starts in the shoot of *Sequoia sempervirens* in a region near or somewhat below the axil of the leaf into which the strand will extend. Following initiation, differentiation proceeds both basipetally and acropetally. Phloem differentiation is a continuous acropetal process, all phloem elements arising in contact with previously differentiated phloem. Acropetal differentiation of xylem in the leaf is very rapid and may outstrip phloem so that protoxylem may be found in the leaf tip above protophloem.

In so far as the materials and methods used in this study are critical, it seems apparent that procambium differentiation is also continuous and acropetal. At least, no instance was found in which procambium was not continuous from the uppermost differentiated vascular strands into young leaves and into the shoot apex.

If protophloem and procambium are continuous from mature vascular tissue into the apical meristematic region, then these tissues should be adequate to provide for the conduction of organic nutrients and phloem mobile minerals into this active region. Possibly, also, these tissues take part in the conduction of hormones or other regulating growth factors into the shoot apex region. *Author's summary.*

12.14.4 : 12.25 : 12.11.3. CROSS, G. L. **The shoot apices of the Sequoias.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (6s). [University of Oklahoma, Norman, Okla.] L.S.

The shoot apices of *Sequoia* and *Sequoiadendron* are

similar to those of other genera of the Taxodiaceae. The apical meristem in each genus consists of a tier of apical initials, a flanking protoderm, a group of subapical initials, a peripheral meristem and a core of pith mother cells. This description is not in accord with those of Strasburger (1872) and Douliot (1870) for *Sequoia sempervirens*. The apical meristem of *Sequoia* is greater in diameter than that of *Sequoiadendron*. This difference in size is a result partially of differences in cellular number; however, statistical analyses show that the nuclear diameters, minor dimensions and major dimensions of the subapical mother cells of *Sequoia* are from 20 to 30 per cent. greater than those of *Sequoiadendron*, and it is clear from this that differences in cellular size are involved also. The nuclei and cells of *Sequoia* exhibit greater variations in size than do those of *Sequoiadendron*. It is assumed that the differences in the shoot apices of the two genera are a result of polyploidy in *Sequoia*, and it is suggested that the determination of nuclear size, from 'smears' or other preparations, may prove to be useful as a preliminary method of separating diploid and polyploid individuals.

12.14.4 : 12.25 : 12.11.3. Cross, G. L. **Further studies of the shoots of the Taxodiaceae—*Athrotaxis* and *Taiwania*.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1943 (6s). [University of Oklahoma, Norman, Okla.] L.S.

The cellular patterns in the shoot apices of *Athrotaxis* and *Taiwania* are similar to those of other genera of the Taxodiaceae. At the summit of each apex there is a single tier of apical initials which divide periclinally as well as anticlinally; lateral derivatives of the apical initials differentiate into a well-defined protoderm; basal derivatives of the subapical initials become subapical mother cells; and derivatives of the subapical mother cells differentiate into a ring or cylinder of peripheral meristem and a core of pith mother cells. The apices of *Athrotaxis* are comparatively small (65–120 microns in diameter, measured in a plane equidistant from the shoot tip and the axil of the youngest leaf) and are hemispherical as seen in longisection. On the other hand, the apices of *Taiwania* are more massive (90–160 microns in diameter) and appear parabolic in longisection.

12.14.5 : 12.25. Kozlowski, T. T., and Schumacher, F. X. **Estimation of stomated foliar surface of *Pinus*.** *Plant Physiol.* 18, 1943 (122–7). [Duke University, Durham, North Carolina.] O.B.D.

12.14.4 : 12.26–8 : 12.25. Boureau, E. Les dispositions vasculaires excentriques et pseudo excentriques dans les plantes vivantes et fossiles. **[Eccentric and pseudo-eccentric vascular arrangements in living and fossil plants.]** *C.R. Acad. Sci. Paris* 212 (18), 1941 (756–8). [F.] Biol. Abstr. 17 (11963).

Discussions on the anatomy of *Rhynia major*, *Botryopteris cylindrica*, *Asteroxylon mackiei*, *Libocedrus*, *Cladoxylon*, *Hierogramma*, *Syncardia*, *Clepsydropsis antiqua*.

12.14.5 : 12.25. Helmers, A. E. **The ecological anatomy of Ponderosa Pine needles.** *Amer. Midl. Nat.* 29, 1943 (55–71). [University of Idaho, Moscow, Idaho.] L.S.

A study was made of anatomical modifications in the needles of *Pinus ponderosa* due to the effects of (1) shade, (2) direction of exposure on the tree, (3) extreme exposure to wind, (4) height of insertion on the tree, and (5) age of the tree. The influence of these factors on the depth of the outer stomatal chamber and on the thickness of cuticle, epidermis and hypodermis was particularly noted.

12.14.5 : 12.26–8. Manning, W. E. **A leaf character for Shagbark Hickory.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (13s). L.S.

The leaves of young and mature trees of *Carya ovata* can be distinguished from the leaves of all other northeastern Hickories by one or two dense tufts of hairs on the upper part of each serration; these are usually accompanied by a ciliation of single or fascicled hairs. On seedlings and small saplings of this species the leaf margins are almost uniformly ciliate as in those of Mockernut, Kingnut, and very young Pignut Hickories.

12.14.7 : 12.25 : 12.11.23. Wilde, M. H. **A new interpretation of coniferous cones with special reference to the Podocarpaceae.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (20s). [Mount Holyoke College, South Hadley, Mass.] L.S.

Two species of *Podocarpus* possess similar compound male and female fertile branches. The female fertile branches bear spirally arranged bracts; in the axil of each is a single ovule surrounded by an epimatium (ovuliferous scale), reduced from a secondary, determinate fertile shoot and its appendages. The male fertile branches likewise bear spirally arranged bracts; in the axil of each is a small sessile male cone, a relatively unreduced secondary, determinate fertile shoot. Modifications of the male fertile branch consist in (1) internodal shortening forming primary clusters of cones, (2) loss of all cones except a single terminal one, below which are retained several persistent sterile bracts. Internodal shortening of the secondary and primary vegetative branches results in secondary and tertiary clusters respectively. Ultimately these clusters may be reduced to single cones. Reduction and loss of units have also occurred in the female fertile branches in most species. In a few other species the female fertile branch is organized into a cone. It may be concluded that primitive Coniferae possessed a richly branched habit with similar compound male and female fertile branches; that the simple male cone, a single surviving unit of the primitively compound male fertile branch, is thus homologous with the reduced, axillary secondary units of the female cone; that the great diversity in position of male cones is due to subsequent vegetative branch reduction.

12.14.7 : 12.26–8 : 12.11.23. Langdon, L. M. **On the structure and development of the cupule in the Fagaceae.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (12s). [Goucher College, Baltimore, Md.] L.S.

Indehiscent 1-seeded fruits, tri-carpellate flowers, and special involucres are distinctive of the Fagaceae. There is considerable debate as to the nature of the involucre; whether it is composed of the fused bracteoles of the little dichasium, or represents sterile scales of a condensed cone-like inflorescence, or is a wholly new outgrowth of the sub-floral axis. Developmental and anatomical studies of species of different genera of this family, including *Quercus*, *Fagus*, *Castanea*, *Castanopsis* and *Nothofagus* emphasize the essentially uniform nature of this structure, varied as its external features may be, and reveal it as a ring-like overgrowth of the subfloral axis which more or less completely encloses the 1- to 3-flowered female inflorescence, and bears

numerous acropetally developed scales, variously modified in the different genera. A marked resemblance to the gland-bearing husk enveloping seeds of the Lagenostomales is seen in the gland-adorned segments of involucres encasing the female florets and nutlets of certain species of *Nothofagus*.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19. CLEMENTS, F. E. **Cycles and climaxes.** *Chron. bot.* 7, 1942 (241–3). [Laboratory of Ecological Research, Santa Barbara, California.] O.B.D.

A discussion on the great geological and climatic cycles of the earth's history and their influence on the movement of vegetational climaxes with their animal populations. New forms and communities are the direct outcome of climatic compulsion, and each of the three life-eras has been marked by the rise into dominance of a particular group—fernworts, gymnosperms or angiosperms. Relicts of former climaxes sometimes occur as one or more dominants in the form of islets in the existing climax or disclimax. These have been able to survive under the new climate only because of some type of compensation, and their relation to the present climax is denoted by the terms *postclimax*, for which the requirements are greater than for the climax in possession, and *preclimax*, for which they are less.

The existence of solar cycles corresponding to sunspot extremes is now completely established, and from the evidence there is a high degree of probability of the existence of corresponding cycles in rainfall. Although climatic cycles may differ greatly in intensity and duration, the course of events is fundamentally the same, and in spite of the fact that sunspot cycles may be of short duration their intensity may resemble that of a grand cycle, as in the case of Santa Barbara where the annual rainfall records show a fluctuation from 4 to 44 in. in 70 years. Man is also playing an important rôle in that he is able to set up minor cycles of his own. Under his influence, Europe and parts of North America have become little more than a mosaic of artificial, controlled disclimaxes. The new phase of conservation must aim at a more or less complete return to the climax as the norm by means of the process of compensation.

12.19 (469) : 61.4. DE CARVALHOE, V. J. Acêrca da carta fitogeográfica. **[Regarding phytogeographical maps.]** *Ser. Estud. Inform. Tec., Minist. Econ., Serv. Edit. Repart Estud., Inform. Prop., Lisboa* No. 20, 1942. pp. 19. [Port.] C.G.B.

The advantages of phytogeographical maps for the study of the vegetation of a region are given. A study of the existing associations can often prevent failures through the introduction of unsuitable plants, especially in schemes of afforestation, reclamation of sand dunes, and in similar projects. Such studies also reveal the genetical centres of origin of the species concerned. In Portugal are the centres for such genera as *Ulex*, *Thymus*, *Genista* and *Digitalis* and secondary centres for *Quercus*, *Dianthus* and other genera. This country also forms a part of the centre of many Mediterranean species such as *Avena strigosa*, *Olea europea*, globe artichoke, yellow lupin, beet and pear.

A phytogeographical investigation of the Duro basin and the Lisbon peninsula is now in progress. P. S. H.

12.19. TRIMBLE, F. M. **Mass color in protective concealment.** *Trees, Sta. Monica, Calif.* 5 (6), 1943 (8, 18).

It is suggested that when the erection of new structures or transportation lines important to the war effort is contemplated, consideration should be given to the availability of topographic features and plant growth that will offer the maximum amount of natural protective concealment.

In protective concealment it is of primary importance that basic colouring should conform as far as possible to the normal appearance of plant growth and soil in the immediate environment. Examples are given of some of the major plant-growth regions of the United States, each of which is represented by a natural basic colour which, however, may vary with variations in species or soil. While a uniform mixture of softwoods and hardwoods is ideal for summer protection, concealment must in such cases keep pace with seasonal changes. Living plant material should therefore be used, if possible, where permanent concealment is necessary.

12.19 : 12.26–8. SMITH, A. C. **Geographic distribution and speciation in the Winteraceae.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (17s). [Arnold Arboretum.] L.S.

As now constituted, the Winteraceae is a family of 6 genera and about 88 species, occurring in the Australasian and Malayan regions and also in America south of Mexico. The criteria used for generic delimitation in the family are discussed. The genus *Drimys* is an interesting illustration of bicentric-palaeantarctic distribution; the probable method of differentiation in *Drimys* in America is outlined.

12.19 (71 : 72 : 79.8) : 11.1 : 11.49 : 12.19.2–3. CHANDLER, R. F. **Some observations of soils and vegetation in Canada, southern Alaska, and Mexico.** *Chron. bot.* 7, 1942 (271–2). [Cornell University, Ithaca, N.Y.] O.B.D.

Notes on soil and vegetational types observed by the author during a trip through Canada, Alaska and Mexico. The areas dealt with are (1) northeastern Canada (the provincial border between Quebec and Ontario, latitude 49°N.), (2) Western Alberta (around Edmonton), (3) central British Columbia (Aleza Lake), (4) western British Columbia (near Prince Rupert), (5) southeastern Alaska (near Juneau), and (6) Mexico. The climate of each region is indicated, and some general observations are made on the soil and vegetation (mainly tree species) of the areas visited.

12.19 (71.1–11 : 72 : 78.6–79.7). DAUBENMIRE, R. F. **Vegetational zonation in the Rocky Mountains.** *Bot. Rev.* 9, 1943 (325–93). [University of Idaho.]

Although the basal plains from which the Rocky Mountains rise are arid, and support only a grassland or desert vegetation, there is sufficient precipitation on the intermediate slopes to allow the development of coniferous forests. This forest vegetation may be subdivided into the following five altitudinal zones, each characterized by a climax association:—(1) Engelmann Spruce/subalpine Fir zone, (2) Douglas Fir zone, (3) Ponderosa Pine zone, (4) Juniper/Piñon zone, and (5) Oak/Mountain Mahogany zone. Above the forest is a zone of tundra vegetation.

The lower altitudinal limits of the forest seem generally to be determined by drought, while physiologic drought is usually the deciding factor in determining the upper timber-line. The typical pattern of zonation may be modified by the omission of one or

more zones, or by the large-scale invasion of other communities.

The vegetation of each zone is discussed, emphasis being given to the influence of climatic and environmental factors on the altitudinal stratification of plant life.

12.19.1. *Regional Floras*

12.19.1 (56–8). ZOHARY, M. **Geobotanical analysis of the Syrian desert.** *Palest. J. Bot.* [*Jer. Ser.*] 2, 1940 (46–96 + plates).

In the first, general part of this paper the author discusses the geographical limits of the region, its orography and hydrography, geology, soil, and climate, and he reviews the history of its botanical exploration. Owing to diversity of conditions the flora is very varied.

The second, special part of the paper deals with (1) the mono-regional plant groups, including the Mediterranean, the Irano-Turanian, the Saharo-Sindian, the Sudano-Deccanian, and the Eurosibero-Boreoamerican; (2) the bi- and pluri-regional plant groups; and (3) endemism.

Tree associations described in this paper include:—(1) Mediterranean region—*Pinus halepensis/Hypericum serpyllifolium*; *Quercetum calliprini*; *Quercetum ithaburensis*; a mountain type including specimens of *Crataegus monogyna*, *Acer microphylla*, *Cotoneaster nummularia*; *Juniperus phoenicea* association. (2) Irano-Turanian region—*Pistacietum atlanticae*, the most important arboreal plant association of the Syrian Desert; *Zizyphetum loti*; *Rhus tripartita* association (rare); *Populetum euphraticae*, a gallery forest frequenting river banks. (3) Saharo-Sindian region—*Haloxylonetum persici*. (4) Sudano-Deccanian region—*Zizyphus spina christi* is the most widespread tree in this region.

12.19.1 (56.9) : 12.26–8. EIG, A., and FEINBRUN, N. **Plants new for Palestine II.** *Palest. J. Bot.* [*Jer. Ser.*] 2, 1940 (97–102).

The list includes 2 species and 5 hybrids of *Salix*.

12.19.1 (729.3). HODGE, W. H. **Some aspects of the vegetation of Dominica, B.W.I.** *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (11s). [Massachusetts State College, Amherst, Mass.] L.S.

Because of the rugged terrain, which has restricted agriculture, the natural flora of Dominica has been well preserved. Four principal types of vegetation are recognized:—(1) the pantropical vegetation of the strand; (2) the xerophytic scrub forest of the leeward coasts—typical of elevations up to 1,000 ft.; (3) the broad-leaved, evergreen, montane rain forest occurring at elevations of 1,500–2,500 ft.; and (4) the mossy elfin forest of the highest summits—above 3,000 ft.

12.19.1 (729.5) : 12.25 : 12.26–8 : 21.61 : 31.2 : 12.11.2. HOLDRIDGE, L. R. **Trees of Puerto Rico. Volumes I and II.** *Occ. Pap. U.S. trop. For. Exp. Sta.* No. 1, 2, 1942. pp. 105 + 105.

This publication, in its present preliminary form, is based on material collected by the Tropical Forest Experiment Station. Its aim is to present, as far as possible in non-technical language, descriptions of native and introduced trees found in the island of Puerto Rico, so that such trees may be identified by persons interested but not trained in technical botany. Parts I and II each contain illustrated descriptions of 50 species, representing in all 44 families. Information is given on such matters as the natural range and habitat of the species, its appearance and growth, properties of the wood, and methods of propagation. Technical terms are used only where required for accuracy. A short glossary of technical terms is appended to each part, and an index of species is included.

12.19.1 (73). BLAKE, S. F. **State floras of the United States.** *Chron. bot.* 7, 1942 (258–61). [Bureau of Plant Industry, U.S. Department of Agriculture.] O.B.D.

Substantially an extract from a larger list [cf. *For. Abstr.* 5 (18)] published recently by the U.S. Department of Agriculture under the title 'Geographical guide to floras of the world. Part I'. The annotations, however, are considerably condensed from those in the complete work, but four floras published since 1939 and one flora of Massachusetts published in 1835 have been added in the present list for the sake of completeness. An accompanying map shows the date of the latest flora in each state, and indicates the areas for which present knowledge of the vegetation is fairly adequate.

12.19.1 (74.7) : 12.19.2 : 12.19.4. ODUM, E. P. **The vegetation of the Edmund Niles Huyck Preserve, New York.** *Amer. Midl. Nat.* 29, 1943 (72–88). [University of Georgia, Athens, Georgia.] L.S.

The Huyck Preserve is a tract of about 500 acres situated on the Helderberg peneplain of east-central New York in the ecotone between the northern or transcontinental coniferous forest region and the eastern deciduous forest region. About 373 acres of the Preserve consist of terrestial habitats, of which 153 acres may be classified as in the early seral stages (about half plantations); 140 acres are intermediate forests, and 80 acres represent mature or late seral stages. The planted trees, mainly *Pinus resinosa*, *Picea canadensis*, and some *P. abies*, are foreign to the region. There are no virgin forests, and probably the original vegetation was mainly Eastern Hemlock. The climax vegetation appears to be a Beech/Hemlock association or a Hemlock consociation, or both intermixed. The Beech/Hemlock association is reproducing well, but Hemlock predominates over Beech on an average of about 2 to 1. In the Beech–Hemlock areas reproduction of other species is at present relatively unimportant. In other communities, however, reproduction is generally different in kind or proportion from the dominants, forecasting a successional change. The expected successions are outlined.

12.19.1 (75) : 12.19.4. MCVAUGH, R. **The vegetation of the granitic flat-rocks of the southeastern United States.** *Ecol. Monogr.* 13, 1943 (119–166). [Bureau of Plant Industry, U.S.D.A.]

The peculiar exposures of granitic rocks, which occur in the Piedmont region of the southeastern United States in an irregular, broken band extending from North Carolina to eastern Alabama, support a very limited vegetation composed mainly of short-lived annuals and species with succulent leaves and stems or bulbous bases. Several of these species are taxonomically unique, and some (as far as is known) are confined entirely to these outcrops. As a rule, most of the species present on the flat-rocks are greatly restricted in occurrence, except under the extreme conditions of habitat found in this area.

Most of the flat-rocks, however, are surrounded, at least partially, by woodlands, and a few tree species exist in shallow depressions on the rocks themselves.

The forests which border the area are mainly second-growth stands, dominated by *Pinus taeda* and including *P. echinata* and various species of Oaks.

The topography of the flat-rocks is such that runoff of surface water is unusually high. The small pioneer plants add little to the soil in which they grow, and erosion is accentuated by the action of wind, heavy rains, dessication, and fire. The vegetational succession is slow.

The possible origins of the flat-rocks are discussed, and sections are included on the origin and succession of vegetation on the flat-rocks, in depressions, and on marginal zones. A catalogue of species, and notes on the location of the principal flat-rocks are appended.

12.19.1 (75.4) : 12.19.2 : 12.19.4. DARLINGTON, H. C. **Vegetation and substrate of Cranberry Glades, West Virginia.** *Bot. Gaz.* 104, 1943 (371–93). [Marshall College, Huntington, West Virginia.] O.B.D.

The Cranberry glades of Pocahontas County cover an area of about 600 acres, some 80 of which are bog forest. They occur in a fairly level area surrounded by hills ranging from 4,000 to 4,600 ft. Variation in altitude results in the persistence of 3 climaxes:—(1) the northeastern coniferous forest, (2) transition forest, and (3) eastern deciduous forest. Quadrat studies on Round Hill at 3,550 ft. showed the presence of the following species:—*Acer saccharum* (70 per cent.), *Fagus grandifolia* (4 per cent.), *Betula lutea* (10 per cent.), *Prunus serotina* (6 per cent.), *Tilia americana* (5 per cent.) and *Prunus pennsylvanica* (5 per cent.).

At 4,100 ft., on Cranberry Mountain, investigations showed *Betula lutea* (30 per cent.), *Acer saccharum* (33 per cent.), *Picea rubra* (20 per cent.), *Fagus grandifolia* (6 per cent.), *Tsuga canadensis* (5 per cent.), and *Ostrya virginiana* (6 per cent.). At 4,500 ft., on Kennison Moutain, a quadrat study revealed 65 per cent. *Picea rubra* and 30 per cent. *Betula lutea*. *Taxus canadensis* was frequently found in the area as a low shrub, while *Populus tremuloides* and *Prunus pennsylvanica* were observed chiefly on a burned-over area.

The bog forest appears to be encroaching on every side of the area, although mainly in the west (the direction of the prevailing winds). The shrubs which at present cover most of the district will probably in time be replaced by the bog forest which will in all likelihood continue as an edaphic climax until stream erosion has removed the peat accumulation and provided sufficient drainage to allow the regional climax forest to become established.

12.19.1 (75.5) : 12.25 : 12.26–8. ALLARD, H. A., and LEONARD, E. C. **The vegetation and floristics of Bull Run Mountain, Virginia.** *Castanea* 8, 1943 (1–64). [U.S. Department of Agriculture.]

An ecological and floristic survey was made of the Bull Run Mountain and Pond Mountain highlands of Virginia, located about 40 miles from Washington, D.C.

This paper gives a brief account of the vegetation of the region and lists all the vascular plants collected or known to occur within the area.

The original forest of the Bull Run highlands was Oak/Chestnut in composition, the dominant species being *Quercus montana* (the major dominant) and *Castanea dentata*, together with *Quercus rubra*, *Nyssa sylvatica*, *Liriodendron tulipifera* and *Carya*. Following the elimination of Chestnut the composition of the forest is rapidly changing into an Oak/Hickory association. On the thin, sandy, porous soils of some of the drier ridges *Quercus montana* forms almost pure stands with Hickory reproduction becoming established in some situations. These dominant Chestnut Oak stands represent an edaphic climax; the original climax type on the deeper and moister soils was largely a mixed mesophytic forest of White Oak, Chestnut Oak, Red Oak, Black Oak, Black Gum, Hickory, Tulip Poplar, White Ash, and some Beech.

Abandoned lands and pastures as a rule revert quickly to forest, mainly of Pines, Cedars, Locust (*Robinia pseudoacacia*), Persimmon (*Diospyros virginiana*) and Tulip Poplar. The most aggressive conifers are Scrub Pine (*P. virginiana*) and Red Cedar (*Juniperus virginiana* var. *crebra*). Other conifers found in the area are *Pinus strobus*, *P. pungens*, *P. rigida* and *P. echinata* (one tree).

12.19.1 (75.9) : 12.19.4 : 12.19.2 : 11.49. LAESSLE, A. M. **The plant communities of the Welaka area, with special reference to the correlations between soils and vegetational succession.** *Publ. Univ. Fla. biol. Sci. Ser.* 4 (1), 1942 (1–143 + plates). [University of Florida.] Biol. Abstr. 17 (10755).

This paper describes the plant communities of a 2,180-acre tract of diversifisd country in northeastern peninsular Florida. The soil consists mainly of marine and residual sands of Pleistocene age. Soil bisects in conjunction with line transects show how changes in vegetation are correlated with soil differences. The driest and poorest sand is occupied by *Pinus clausa* and broad-leaved evergreen shrubs, mainly *Quercus* spp., *Serenoa* and *Xolisma*. This, in the absence of fire, may be followed by a *Quercus virginiana* 'hammock', and show an approach to the climax, *Magnolia grandiflora/Ilex opaca* 'hammock'. Well-drained Norfolk fine sand supports a fire climax of *Pinus australis* and *Q. laevis*, which may be succeeded by Live-Oak 'hammock' and finally by the climax *Magnolia/Ilex* 'hammock'. The less well-drained 'flatwoods' are for the most part dominated by *Pinus australis* with an understorey of *Aristida stricta*; but slightly higher areas may support a dwarf Evergreen Oak association, developing later into a Live-Oak 'hammock'. Later still, the climax *Magnolia/Ilex* stage may be reached. Lower portions of the 'flatwoods' are generally occupied by *P. palustris* and *P. serotina* with an understorey of broadleaved evergreens or of grasses. Two well-marked hydroseres were found, one in the 'flatwoods' ponds, the other along the St. Johns River. Here, too, the plant succession is indicated. Succession taking place in abandoned fields, firelanes, roads of sand, clay and shell, roadsides, ditches and lawns are discussed. An annotated list of vascular plants is given.

12.19.1 (77.1) : 12.19.2 : 11.34 : 11.41.3 : 12.19.4. COBBE, T. J. **Variations in the Cabin Run forest, a climax area in southwestern Ohio.** *Amer. Midl. Nat.* 29, 1943 (89–105). L.S.

A study was made of individual communities representing variations in the climax forest in Clermont County, southwestern Ohio. These variations are due to differences in slope exposure, soil moisture and the interaction of vegetation.

The climatic climax vegetation is the mixed mesophytic forest which is found in some form on all protected ravine slopes, being very dense and essentially mesophytic on north slopes. This forest type includes six important tree species—*Acer saccharum*, *Fagus*

grandifolia, *Liriodendron tulipifera*, *Tilia americana*, *Juglans nigra*, and *Quercus alba*—and fourteen others.

As site exposure increases Oaks become more important, forming Oak transition communities, and the driest situations on the ridges support the Oak–Hickory forest. The dominants in the Oak–Hickory communities are Red Oak (*Quercus borealis* var. *maxima*), White Oak, (*Q. alba*), Chestnut Oak (*Q. montana*), and Hickory (*Carya* spp.).

12.19.1 (81). SOBRINHO, V. As regiões naturais de Pernambuco. **[The natural regions of Pernambuco.]** *Arq. Inst. Pesq. agron. Pernambuco* 3, 1941 (23–33 + plates). [Port.] *Abstr.* in *Trop. Woods* 74, 1943 (46).

The various vegetative zones are delimited, described, and illustrated. There are notes on the principal species, particularly the trees, but for many of the species only the common names are given.

12.19.1 (86) : 12.26–8. CUATRECASAS, J. Notas a la flora de Colombia. **[Notes on the flora of Colombia.]** *Rev. Acad. Col. Cienc. exact., fís. nat., Bogotá* 5 (17), 1942 (16–39 + plates). [Span.] *Abstr.* in *Trop. Woods* 74, 1943 (44).

Descriptions of new species, varieties, etc., in the genera *Espeletia, Culcitium, Senecio, Mutisia, Weinmannia, Polylepis, Brunellia, Trichilia, Picramnia, Halenia, Hypericum*, and *Cavendishia*.

12.19.2. *Forest Types*

12.19.2 (71.3–6 : 74) : 12.26–8. DANSEREAU, P. L'érablière laurentienne. I. Valeur d'indice des espéces. **[The Sugar Maple grove of the St. Lawrence. I. Index value of the species.]** *Canad. J. Res.* 21, Sec. C, 1943 (66–93). [F.f.e.] [Institut de Biologie de l'Université Montréal, Montréal, Qué.] A.P.B.

The area of the Sugar Maple [*Acer saccharophorum* (*A. saccharum*)] groves includes, roughly, the northern half of the deciduous forest of north-eastern America, bounded on the east by the Atlantic, on the south by the subtropical sclerophyllous woodland, on the west by prairie, and on the north by the Canadian Spruce forest. The area studied corresponds to a fairly homogeneous geographical unit. A random selection of 180 stands in which Sugar Maple was present, were carefully studied as to soil, height and diameter of trees, exposure, slope, cover percentage of different strata, and species present, with abundance and sociability category.

The 180 stands, in which 346 species occurred, were found to be of very unequal value. In order to develop a standard for determining the relative ecological position of the various stands and for segregating the typical stands of the Maple grove, each of the 346 species was examined with reference to:—(*a*) life form. (*b*) percentage of presence in the 180 stands, (*c*) reaction to light, (*d*) reaction to humidity, (*e*) fidelity to the Maple grove. On the basis of this examination index values were established for each species, so that ecological position for individual stands could be determined from a record of the number of species and their abundance, and typical Maple-grove stands could be isolated for use in establishing the association chart and biological formula of *Aceretum saccharophori*.

12.19.2 (74.7–8) : 22.88.1 : 91.3. **The Tionesta natural and scenic area.** *Chron. bot.* 7, 1942 (272–3). O.B.D.

This tract of 4,131 acres is the largest single remnant of the virgin forest which once occupied 6 million acres of the Allegheny Plateau in New York and Pennsylvania. Its chief constituent is Hemlock of great age and size. The chief hardwood species is Beech, while Sugar Maple, Yellow Birch, Sweet Birch and Red Maple are present in smaller numbers, and there are scattered individuals of other species. This relatively undisturbed climax-forest environment offers unique opportunities for studying such factors as the interrelationship between plant life and various animal species, the influence of forest cover on the hydrologic cycle and on microclimate, and particularly the connexion between forest cover and the absence of 'frost pockets', which are a conspicuous feature of cutover lands on the Allegheny Plateau.

12.19.2 (74.8) : 22.88.1 : 11.49. HOUGH, A. F. **Soils in a virgin Hemlock–Beech forest in the northern Allegheny Plateau.** *Soil Sci.* 54, 1942 (335–41). [Allegheny Forest Exp. Sta.] O.R.E.

Independent studies were made of soil types based on profile characteristics, and of the species composition, abundance, and frequency of occurrence of trees in a virgin Hemlock–Beech forest in northwestern Pennsylvania. The three major soil types in this forest differed in profile characteristics as a result of past geological, physiographic and pedological history, especially drainage conditions.

Statistical comparisons of plots on each soil type, using basal area as an indication of productive capacity or stocking in this uneven-aged virgin forest, failed to reveal major differences in the average basal area or percentage species composition between any two of these three major soil types. This is explained on the basis of (*a*) the adaptability of the native old-growth tree species to a rather wide variety of different sites, (*b*) the generally heavy texture of the Allegheny Plateau soils and abundant well-distributed precipitation, which tend to reduce the importance of soil factors as limiting to virgin tree growth, and (*c*) the action of certain powerful climatic and biotic factors, which are fully as important in guiding the development of the virgin forest as is the influence of existing soil type differences. *Author's summary.*

12.19.2 (76.1) : 12.26–8. HALL, T. F., and PENFOUND, W. T. **Cypress–Gum communities in the Blue Girth Swamp near Selma, Alabama.** *Ecology* 24, 1943 (208–17). [Tulane University, New Orleans, La.]

The swamp studied included two arborescent types:—a Tupelo Gum/Cypress/Swamp Black Gum forest which occupied a small portion of the shallow swamp margin, and the Tupelo Gum/Cypress complex, which was composed of the Tupelo Gum/Cypress associes and the Cypress consocies. The arborescent communities were characterized by a stratum of tall, slender trees; by the absence of small tree, shrub, and emergent herbaceous strata, and by an abundance of floating-leaved and submergent aquatic herbs. All the trees possessed swollen bases. Cypress knees were present in all communities, but Gum knees were not found.

The Tupelo Gum/Cypress/Swamp Black Gum, the Tupelo Gum/Cypress, and the Cypress communities were all characterized by an unusually large number of trees per acre (576, 438, and 338, respectively). Furthermore, they possessed a very high basal area as determined at the bottle-neck (481, 336, 409 sq. ft. per acre, respectively). These figures are more than twice those for old-growth stands of upland timber. *From authors' summary.*

12.19.2 (77.2). POTZGER, J. E., and FRIESNER, R. C. **An ecological survey of Berkey woods, a remnant of forest primeval in Kosciusko County, Indiana.** *Butler Univ. bot. Stud.* 6, 1943 (10–6). A.P.B.

The study was based on fifty 100 sq. m. quadrats. *Acer saccharum, Fagus grandifolia* and *Ulmus thomasi* are the chief species of the crown cover, and all three showed excellent reproduction. The woods are representative of the mixed mesophytic climax of the district.

12.19.4. *Succession*

12.19.4 (77.5). THOMSON, J. W. **Plant succession on abandoned fields in the central Wisconsin sand plain area.** *Bull. Torrey bot. Cl.* 70, 1943 (34–41). [Superior State Teachers College, Superior, Wis.] O.B.D.

The plant succession is from a weed flora for the first few years to a prairie flora which reaches its maximum about 15 years after the fields have been abandoned, and finally to a climax forest of Jack Pine (*Pinus banksiana*) and Oak (particularly *Quercus ellipsoidalis, Q. velutina* and *Q. macrocarpa*). Thirty-seven years after the field under observation had been abandoned the forest had encroached considerably on the prairie flora. *Pinus banksiana* was the dominating member of the flora, but *Populus grandidentata* and various shrubby plants, including *Myrica asplenifolia, Corylus americana*, young *Quercus ellipsoidalis*, and *Rubus* sp. were present in considerable numbers.

12.2. *Special [Systematic] Botany*

12.21. Fungi

12.21 : 12.14.7 : 31.42.11. DARLEY, E. F., and CHRISTENSEN, C. M. **An unusual sporophore of *Trametes suaveolens* produced on artificially inoculated wood.** *Phytopathology* 33, 1943 (328–30). [University Farm, St. Paul, Minn.]

A sporophore of *Trametes suaveolens* produced artificially in the laboratory showed deviations from normal in size and general form. It is pointed out that if small differences in environment are thus capable of inducing considerable variations in gross morphology, too much importance must not be ascribed to minor morphological differences found in nature.

12.21 : 13.2 : 13.11. VERRALL, A. F. **Fungi associated with certain ambrosia beetles.** *J. agric. Res.* 66, 1943 (135–44). [U.S.D.A. Bureau of Plant Industry.] O.R.E.

A report of the mycological findings in a general study of the biology of ambrosia beetles in the Southern States begun in 1937 by the Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture. Four new species of fungi are described:—*Endomyces bispora* associated with *Platypus compositus*; *Cephalosporium pallidum* associated with *Xyleborus affinis*; *C. luteum* with *X. pecanis*; and *Monilia brunnea* with *Pterocyclon mali* and *P. fasciatum*. These fungi are probably used as food by the beetles and may be responsible for the restricted black or brown stain adjacent to the beetle tunnels.

12.21 : 12.11.12. ROBBINS, W. J., and MA, R. **Vitamin deficiencies of *Ceratostomella* and related fungi.** *Amer. J. Bot.* 29, 1942 (835–43). L.S.

Thirteen species of *Ceratostomella* and related fungi were grown in a mineral-dextrose medium containing asparagine, and in the same medium supplemented with thiamine, pyridoxin or biotin, singly and in combination, or with malt extract. Eleven of the species suffered from complete or partial deficiencies for one or more of the three vitamins. Six had complete or nearly complete deficiencies for pyridoxine, four for thiamine, and four for biotin.

Ceratostomella obscura showed a complete deficiency for pyridoxine and biotin, and *C. microspora* for all three vitamins. Six of the fungi grew markedly better in a medium supplemented with malt than in media supplemented with the three vitamins. *Authors' summary.*

12.21 (73). DAVIDSON, R. W. **Some additional species of *Ceratostomella* in the United States.** *Mycologia* 34, 1942 (650–62). R.A.M. 22 (178).

This list of species of *Ceratostomella* isolated from decayed wood includes *C. stenoceras* and *C. minutum* and also three new species, *C.* (*Ophiostoma*) *microspora*, *C.* (*Grosmannia*) *leptographioides*, and *C.* (*G.*) *rostrocylindrica*. So far as is known none of the species isolated is associated with disease in the host.

12.21 (74.7) : 44.3 : 12.25 : 12.26–8. DEARNESS, J., and HOUSE, H. D. **New or noteworthy species of New York fungi. V.** *Circ. N.Y. St. Mus.* No. 24, 1940 (25–60). R.A.M. 22 (177).

This list, dealing with collections of fungi mainly from New York State, contains the names of 37 new species and 48 new records for the state. The fungi belong to the Phycomycetes, Ascomycetes (chiefly Pyrenomycetes), Basidiomycetes, Spaeropsidales, and Moniliales. Species included are *Phyllosticta destruens* on *Prunus virginiana*, *Sphaeronema pithyum* on *Pinus strobus*, *Cytospora translucens* on *Salix alba*, and *Fusarium episphaericum* which is parasitic on the black knot fungus (*Dibotryon morbosum*) on *Prunus virginiana*.

12.25. Gymnosperms

12.25. CAHEN, E. **The Ginkgo through the ages.** *J.R. hort. Soc.* 68, 1943 (99–105 + plates). E.M.B.

This account of the Ginkgo includes notes on its history and the history of its name, on its seed and flowering habit, and on its introduction into Europe. Mention is made of individual trees growing in Britain.

12.25 (46) : 23.24.3 : 24.2 : 24.5. ECHEVERRÍA, I. Tratamiento del 'Pinus insignis': espesuras, podas, claras. **[The treatment of *Pinus insignis*: spacing, pruning, thinning.]** [*Publ.*] *Instituto Florestal de Investigaciones y Experiencias, Madrid.* 14 (26), 1943. pp. 153. [Span.]

From his experience and from sample-plot studies in Spain the writer recommends an initial spacing of 1·50 by 1·50 m., light thinnings at 3-year intervals, and gradual pruning which should always be limited to the portion of the crown below its maximum width. Thinning tables are included.

12.25 (485) : 21.61. ARNBORG, T. Busktallen. En inventering. **[The Bush Pine: A survey.]** *Skogen* 28, 1941 (174). [Sw.]

The 'Bush' Pine, so-called because of its bush- or broom-like habit, caused by the stem being divided near ground-level into a number of erect 'branch stems'* of uniform size, is found in many parts of central Sweden and especially in Uppland. The young trees lack the usual main trunk but often as they grow older the individual stems fuse to form a short thick stem which branches into a number of stems of equal thickness, often forming a very dense crown. It is the *Pinus*

*[Grenstammar].

sylvestris f. *condensata* described by Th. Fries in *Botaniska Notiser*, 1890, and subsequently sometimes inaccurately referred to as f. *fastigiata*.

In citing a few historical notes on the nomenclature and incidence of this economically worthless Pine the author regrets that no systematic attempt has yet been made to collect information about this interesting type which may perhaps soon disappear; and he therefore urges readers of the journal to co-operate, before it is too late, in recording and describing local specimens.

For some years the author has been studying occurrence of the tree and has collected descriptions and photographs of it in various localities. As far as can be judged at present, the Bush Pine is found mostly in central Uppland where it occurs singly or in small groups. In Rasbo it occurs in conjunction with another pronouncedly aberrant form of conifer—the sparsely branched 'worm-like' Norway Spruce [ormgran].* From the information received so far, the Bush Pine seems to be well known in the parishes in the immediate vicinity of Uppsala. Since for the author's study it is desirable to examine some of the trees in the various localities, he hopes that no specimens will be felled where that can be avoided. M. L. C. W.

12.25 (72):21.0 (410). OSBORN, A. ***Pinus montezumae***. *Gdnrs' Chron.* 112 (third series) (2922), 1942 (247). O.B.D.

The Rough-barked Mexican Pine (*Pinus montezumae*) is a variable and widely distributed tree of the Mexican forests, the type species growing at low elevations in subtropical regions. One of its varieties (var. *hartwegi*) occurs at elevations up to 10,000 ft. Many of the varieties were previously described as species. Conditions suitable for the cultivation of this tree in the British Isles are confined to the south and west, particularly Cornwall and South Devon.

12.25 (729.2) : 56 : 11.62.11. JAMAICA. **Annual report of Forest Division, Department of Agriculture, for year ending March 31st, 1942.** (Abbreviated report.) Department of Agriculture, Kingston, Jamaica, B.W.I. [1942?] Pp. 3 + tbls.

Pinus massoniana has shown very good growth on degraded mountain soils (p. 2).

12.25 (74.7) : 21.12. VAUGHN-EAMES, H. **Experiments with Redwoods around New York**. *Trees, Sta. Monica, Calif.* 5 (6), 1943 (11).

Sequoia sempervirens from California failed to grow satisfactorily in the New York district owing to its extreme susceptibility to frost. *Sequoia gigantea*, on the other hand, proved much more adaptable. Trees of this species were shipped from California in 1- and 2-gal. containers and planted immediately. The tree appears to be highly disease-resistant, and is quite hardy, although some winter protection was thought advisable. So far, attempts to raise seedlings have failed due to damping-off.

12.25 (75.6–8 : 76.1–2 : 76.8–9) : 12.14.4–5 : 12.14.7 : 12.19. PERRY, G. S. **Keys to the Pines of the Tennessee Valley**. Department of Forestry Relations, Tennessee Valley Authority. (Revised ed.) 1940. pp. 12.

Three keys to the Pines of the Tennessee Valley are given:—(1) needle and twig key, (2) cone key, and (3) natural occurrence key. Six native species of Pine and five introduced species are described. The native Pines are White Pine (*Pinus strobus*), Loblolly Pine (*P. taeda*), Pitch Pine (*P. rigida*), Shortleaf Pine (*P. echinata*), Scrub Pine (*P. virginiana*) and Table Mountain Pine (*P. pungens*). The introduced species are Longleaf Pine (*P. palustris*), Slash Pine (*P. caribaea*), Scotch Pine (*P. sylvestris*), Austrian Pine (*P. laricio*) and Red Pine (*P. resinosa*).

12.25 (79.4) : 12.19 : 21.9 : 91 : 4. COOK, L. F. **The Giant Sequoias of California**. Govt. Printing Office, Washington. 1942. pp. 28 + map. [National Park Service.]

A non-technical account of the Giant Sequoia (*Sequoia gigantea* [Lindl.] Decn.) prepared mainly for the use of visitors to the Giant Sequoia groves in some of the United States National Forests and Parks. The tree is described in general terms, its history is outlined, and short notes are given on its conservation, distribution, size, age, insect and other enemies, and on the differences between this species and the Redwood (*Sequoia sempervirens* Endl.).

12.26–8. Dicotyledons

12.26–8. BAILEY, I. W., NAST, C. G., and SMITH, A. C. **The family Himantandraceae**. *J. Arnold Arbor.* 24, 1943 (190–206 + plates). [Biological Laboratories and Arnold Arboretum, Harvard University.]

A diagnosis of the technical characters of *Himantandra*, the sole genus of the family Himantandraceae, and of the two known species *H. belgraveana* and *H. baccata*. In the second part of the article the internal and morphological features of the genus are examined with special reference to points not made entirely clear by Dies in his papers published in *Bot. Jahrb.* 48, 1912 (7–13), 49, 1912 (113–67), and 55, 1917 (126–34). Sections are included on the structure of the stem, on leaf and nodal anatomy, and on the morphology of the flowering shoot, the stamens and staminodes, and the fruit. The morphological relationships of the Himantandraceae and the Degeneriaceae and Magnoliaceae are discussed.

12.26–8 : 12.14.7. GILLY, C. L. **Floral structure and classification in the sub-family Mimusopoideae (Sapotaceae)**. *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (9s). [New York Botanical Garden.] L.S.

A study of western hemisphere Sapotaceae has revealed that the terminology of floral parts in the subfamily Mimusopoideae (Hartog) Lam. seems to need reinterpretation. Correlative studies of eastern hemisphere members of the subfamily have been necessary to indicate further the apparent evolutionary trends in the group. A partial result of this study has been the amplification of the subfamily to include certain genera previously placed in subfamilies Sideroxyloideae (Dubard) Lam. and Madhucoideae Lam. The relationship of the subfamily Mimusopoideae, as herein constituted, to the remainder of the family is briefly discussed.

12.26–8 : 12.14.7. GUNDERSEN, A. **The relationships of the Hamamelidaceae**. *Abstr.* in *Amer. J. Bot.* 29 (10), 1942 (10s). [Brooklyn Botanic Garden, Brooklyn, N.Y.] L.S.

The structure of flowers and of flower buds of *Liquidambar* and other genera of Hamamelidaceae is compared with similar structures of Hydrangeaceae,

* Ormgran is so defined in 'A Swedish-English Vocabulary', Yale University, School of Forestry, Bull. No. 40.

Platanaceae, Betulaceae, and Cornaceae. The resemblances are of interest in connexion with early fossil representation in these groups. A diagram presents carpel and stamen structure of various families of dicotyledons.

12.26–8. LITTLE, E. L. **New names in *Quercus* and *Osmanthus*.** *J. Wash. Acad. Sci.* 33, 1943 (8–11). [U.S. Forest Service.] L.S.

New names are suggested for four natural hybrids in *Quercus*, as the existing names must be rejected under Articles 60 (3) and 61 of the International Rules of Botanical Nomenclature (Ed. 3, 1935). The suggested names are × *Quercus asheana* Little (*Q. cinera* × *Q. laevis*) Ashe Oak, × *Quercus burnetensis* Little (*Q. macrocarpa* × *Q. virginiana*) Burnet Oak, × *Quercus cravenensis* Little (*Q. cinerea* × *Q. marilandica*) Carolina Oak, and × *Quercus filialis* Little (*Q. phellos* × *Q. velutina*) Varileaf Oak.

Osmanthus megacarpus (Small) Small ex Little, comb. nov., which has previously been cited only as a synonym, is here published for the sake of validation.

12.26–8. MILLE, L. El Capuli. [**Capulin.**] *Flora (Ecuador)* 2, 1942 (50–1). [Span.] Biol. Abstr. 17 (16922).

General comments on *Prunus salicifolia*.

12.26–8. MOLDENKE, H. N. **An alphabetic list of invalid and incorrect scientific names proposed in the Verbenaceae and Avicenniaceae.** New York Botanical Garden. 1942. pp. 59. *Abstr.* in *Trop. Woods* 74, 1943 (48).

A new and revised edition of a previous paper (1940) and its supplement (1941). The present work contains about 4,700 names.

12.26–8 (410). GODWIN, H. **Rhamnaceae: *Rhamnus cathartica* L., *Frangula alnus* Miller (*Rhamnus frangula* L.).** *J. Ecol.* 31, 1943 (66–92).

The two British species of Buckthorn are separated into the genera *Rhamnus* L. and *Frangula* Miller. A list of the insects, mites and fungi associated with either or both of these species, *Rhamnus cathartica* L. and *Frangula alnus* Miller (syn. *Rhamnus frangula* L.), is followed by a description of each species with relevant available information.

12.26–8 (51 : 59.6–9). MERRILL, E. D., and CHEN, L. **The Chinese and Indo-Chinese species of *Ormosia*.** *Sargentia* No. 3, 1943 (77–117). Biol. Abstr. 17 (12033).

After an introductory discussion of the generic synonymy, the authors list the 64 Old World species, giving the synonymy and geographic range of each. The genus *Podopetalum* F. v. Muell. is reduced to *Ormosia*, which is thus first recorded from Australia. The African species appear to belong either to *Afrormosia* or to *Haplormosia*. The 34 species recognized from China and Indo-China are arranged under 15 series, of which a synopsis is given. An artificial key to the species is followed by detailed synonymy, citations, and discussions of each. Eighteen new species are described, and the paper is concluded by a list of cited specimens.

12.26–8 (53 : 56.8) : 34.27 : 33.06 : 11.62.1. ZOHARY, M. **On the 'Ghada'-tree of northern Arabia and the Syrian desert.** *Palest. J. Bot. [Jer. Ser.]* 1, 1940 (413–6).

From a comparison of specimens collected in the southeastern borders of the Syrian desert in 1929 and 1936 with descriptions and photographs of the 'Ghada' tree recorded by students of Arabia the writer concludes that the tree in question is *Haloxylon persicum* Bge. It occurs in desert districts of Syria and northern Arabia where annual precipitation does not normally reach 100 mm. and is in some cases less than 25 mm., and where the range of temperature may be extreme (+40°, – 8° C.). The species is found in sandy habitats, often in slight depressions or in wadis where it may grow to a height of 4–5 m. On the slopes of sandy dunes it commonly appears as a shrub about 2·50 m. high. The wood of *H. persicum* makes excellent fuel and yields up to 50,000 kg. of charcoal per ha., and the living tree is an important source of food for desert livestock. The writer suggests that the species may be used in turning to good account by afforestation the immense tracts of the Arabian Desert which now lie desolate. In addition to providing valuable fuel and fodder, such afforestation would help materially to check the extension of shifting sands.

12.26–8 (54.2). RAIZADA, M. B. **A new *Pygeum* from Bastar State, Orissa.** *Indian For.* 68, 1942 (421 + plate). [Forest Research Institute, Dehra Dun.]

A botanical description of the new species, *Pygeum mooneyi* Raizada, a small evergreen tree found by the author in a damp ravine at 3,400 ft. on Bailadila Hill, Bastar State. The new species is related to *Pygeum andersoni* HK.f. but differs from it chiefly in some minor characteristics of calyx and petals and in the number of stamens (usually 26 instead of 15).

12.26–8 (66.7) : 21.11. COLLINS, W. S. **Is Iroko doomed?**—With comments. *Farm and Forest* 4, 1943 (44–5).

From his observations on *Chlorophora excelsa* in a district in Western Ashanti the author reports that large trees far outnumber sapling and poles—a condition that indicates a trend towards the local extinction of this species. A Psyllid gall is suggested as the possible cause of the high mortality of seedlings. Comment, based on Nigerian experience, indicates that regeneration of this species requires the opening of the tree- and shrub-layers of the forest to provide light for germination and also requires the protection of seedlings from suppression and from destruction by game and the gall insect.

12.26–8 (66.9) : 21.64. LANCASTER, P. C. **Iroko-producing areas of Owerri Province.** *Farm and Forest* 4, 1943 (76–7).

In Owerri Province (Nigeria) the lack of seedlings of Iroko (*Chlorophora excelsa*) or their destruction by farming, the scarcity of younger age classes and uncontrolled cutting of mature trees, suggest the early total extinction of the species from this region. [Cf. preceding abstract.]

12.26–8 (71.21). FRASER, W. P. **Notes on the Willows of Saskatchewan.** *Canad. Field-Nat.* 56, 1942 (104–10). [University of Saskatchewan.] L.S.

Nearly 30 species and some varieties of *Salix* are briefly described and short notes are given on their distribution and habitat. The descriptions are based on material collected in the southern half of Saskatchewan and on the reports of Raup (*J. Arnold Arbor.* 17, 1936) who made extensive collections in the Athabaska Lake region and northwards. A list of excluded species is appended.

12.26–8 (72 : 728 : 729 : 8). CROIZAT, L. **Novelties in American Euphorbiaceae.** *J. Arnold Arbor.* 24, 1943 (165–89). [Arnold Arboretum, Harvard University.]

Information on new species, trinomials and records collected in the course of routine determinations at the herbarium of the Arnold Arboretum. The new tree species recorded are *Alchornea cyclophylla, Cleidion prealtum, Micrandra santanderensis, Tetrorchidium jamaicense, Sapium bourgeaui* and *S. cuatrecasasii.*

12.26–8 (72 : 8). CROIZAT, L. **Notes on American Euphorbiaceae, with descriptions of eleven new species.** *J. Wash. Acad. Sci.* 33, 1943 (11–20). [Arnold Arboretum of Harvard University.] L.S.

The following new tree species are described:—*Phyllanthus coalcomanensis* Croiz. from Mexico, *Croton aristophlebius* Croiz. from Columbia, *Senefeldera nitida* Croiz. from Brazil, *S. skutchiana* Croiz. from Peru, and *Pedilanthus coalcomanensis* Croiz. from Mexico. Notes are also given on *Phyllanthus botryanthus* Muell.-Arg. from Venezuela, *P. huallagensis* Standl. from Peru, and other species.

12.26–8 (728). MULLER, C. H. **The Central American species of *Quercus*.** *Misc. Publ. U.S. Dep. Agric.* No. 477, 1942. pp. 216.

A key is provided for all the known Central American species of *Quercus*; these are confined to the two subgenera, *Lepidobalanus* (Endl.) Oerst. and *Erythrobalanus* (Spach) Oerst. A botanical description is given for each species and is followed by notes on the habitat of the specimens examined. Of the 46 species described, nine are new. Leaf characteristics are invaluable for distinguishing all categories of *Quercus* from subgenera to species. Leaves and fruit of the various species are clearly illustrated. A list of exsiccatae is included.

12.26–8 (729.1). GILLY, C. L. **Studies in the Sapotaceae, III. A new species of *Manilkara* from Cuba.** *Trop. Woods* No. 74, 1943 (15–7). [New York Botanical Garden.]

The proposed new species, a small tree which is related to both *Manilkara emarginata* (L.) Britton and Wilson and *M. wrightiana* (Pierre) Dubard, is named *Manilkara howardii* Gilly, sp. nov. It differs from the above species in its minute staminodes and in the prominently reticulate under-surface of its leaves. A full botanical description is given.

12.26–8 (76.4). MULLER, C. H. **A new species of *Quercus* in Texas.** *Amer. Midl. Nat.* 28, 1942 (743–5). L.S.

The species, *Quercus houstoniana* sp. nov., is a large tree which appears to be endemic in eastern Texas, occurring commonly in the more mesic forests, particularly in the Big Thicket area, and in the river bottom forests of all the principal East Texas streams. A description of the species is given.

12.26–8 (78.8–79.1 : 79.4). BENSON, L. **Revision of status of southwestern desert trees and shrubs.** *Amer. J. Bot.* 30, 1943 (230–40). [University of Arizona, Tucson, Arizona.] O.B.D.

New combinations in this paper include:—*Platanus racemosa* var. *wrightii* (S. Wats.) L. Benson, comb. nov., *Celtis laevigata* Willd. var. *reticulata* (Torr.) L. Benson, comb. nov., and *Sambucus caerulea* Raf. var. *mexicana* (Presl.) L. Benson, comb. nov.

12.26–8 (81 : 87 : 88). DWYER, J. D. **The taxonomy of the monogeneric tribe Elvasieae (Ochnaceae).** *Bull. Torrey bot. Cl.* 70, 1943 (42–9). O.B.D.

A study of the genus *Elvasia* which includes moderately-sized trees and shrubs that are not considered to be of economic importance. The distribution of the genus is limited to British Guiana, Surinam, Venezuela and Brazil.

The author maintains the two subdivisions *Euelvasia* and *Hostmannia*, which are based on differences in the number of carpels, and proposes a third division *Euessequibensa* based on stigmatic differentiation and variations in the number of stamens. Keys are given to the sections and to the seven species, each of which is described.

12.26–8 (86). WOODSON, R. E., and SCHERY, R. W. **Contributions towards a flora of Panama: VII. Miscellaneous collections, chiefly by H. von Wedel, in Bocas del Toro.** *Ann. Mo. bot. Gdn.* 30, 1943 (83–96). [Henry Shaw School of Botany, Washington University.] O.B.D.

New tree species described in this paper are *Clarisia mollis, Neea xanthina, Xylopia bocatorena, Cymbopetalum magnifructum, Macrolobium modicopetalum, Lonchocarpus monofoliaris, Ormosia stipitata* and *Swartzia nuda* (tree or shrub).

12.26–8 (88.1). SANDWITH, N. Y. **New and noteworthy Polypetalae from British Guiana.** *J. Arnold Arbor.* 24, 1943 (218–26). [Royal Botanic Gardens, Kew.]

The descriptions, new combinations, and notes given in this paper are based on material of Polypetalae collected in British Guiana. Tree species include *Ryania pyrifera* var. *subuliflora* var. nov., *R. pyrifera* var. *tomentosa* and *R. sagotiana* (all small under-storey trees) in the Flacourtiaceae, *Caraipa simplicior* sp. nov. in the Guttiferae, *Byrsonima incarnata* sp. nov. in the Malpighiaceae, *Rhabdodendron amazonicum* and *R. gardnerianum* comb. nov. in the Rutaceae, and *Ouratea cataractarum* sp. nov. and *O. cernuiflora* sp. nov. (both shrubs or small trees) in the Ochnaceae.

12.26–8 (88.1). DWYER, J. D. ***Kaieteurea*, a new genus of the Ochnaceae.** *Bull. Torrey bot. Cl.* 70, 1943 (50–2). O.B.D.

The new genus, *Kaieteurea* Dwyer, gen. nov., consists of trees or shrubs indigenous in the Kaieteur Savanna, British Guiana. The type-species, *Kaieteurea gillyana* Dwyer, sp. nov., is described. In vegetative habits the new genus is related to *Ouratea*, from which it differs chiefly in the structure of its flowers and fruit.

12.26–8 (89) : 23.21 : 21.2–3. GUERREROS, J. A. Los eucaliptos: su cultivo. [**Eucalyptus trees: their cultivation.**] *Rev. Minist. Agric., Comerc. e Indust.* (*Asunción*) 1 (4), 1941 (51–6). [Span.] Biol. Abstr. 17 (12164).

Several Eucalypts may be grown in Paraguay, and it is claimed that different species are available for widely different soils from limey to granite, and for varying degrees of fertility and moisture. Directions for cultivation are given.

12.26–8 (903). SMITH, A. C. **Taxonomic notes on the Old World species of Winteraceae.** *J. Arnold Arbor.* 24, 1943 (119–64). [Arnold Arboretum, Harvard University.]

The purpose of this paper is 'to bring together references to the taxonomic literature, to indicate the

acceptable name for each species, to discuss the typification of species and genera, to mention the known distribution, and to cite the specimens available in American herbaria'. The species dealt with are mainly trees or shrubs from the genera *Drimys*, *Bubbia*, *Belliolum*, *Pseudowintera*, *Exospermum*, and *Zygogynum*.

12.26–8 (95). MERRILL, E. D., and PERRY, L. M. **Plantae Papuanae Archboldianae, XII.** *J. Arnold Arbor.* 24, 1943 (207–17). [Arnold Arboretum, Harvard University.]

Notes are given on species of the Cruciferae, Violaceae, Passifloraceae and Apocynaceae. Tree species in the Violaceae are *Rinorea fasciculata* and *R. solomonensis* from the Solomon Islands, and those in the Apocynaceae are *Alstonia macrophylla*, *A. longissima*, *A. reineckeana*, *Ochrosia glomerata*, sp. nov., from the Solomon Islands, and *Wrightia laevis* from Netherlands New Guinea.

13.1. *General Zoology*

13.11 : 13.2. GOBEIL, A. R. **Diapause and egg intoxication in *Diprion polytomum* Hartig.** *J. econ. Ent.* 35, 1942 (677–9). R.A.E. A31 (243).

Experiments carried out in Canada with *Gilpinia hercyniae* Htg. (*Diprion polytomum*, auct.) showed that the duration of diapause of larvae of this species appeared to be entirely independent of the retention period of the mature eggs in the ovaries.

13.13 : 13.2. GARDNER, J. C. M. **Immature stages of Indian Lepidoptera: (4) Zygaenidae.** *Indian For. Rec. (n.s.) Entomology* 7, 1942 (155–62 + plate). [Forest Research Institute, Dehra Dun.]

Larval characters of the Zygaenidae, of three subfamilies (Phaudinae, Chalcosiinae and Zygaeninae), and of eleven species are discussed.

13.14 : 13.2. KING, E. W. **A taxonomic distinction between *Cyllene robiniae* (Forst.) and *Cyllene caryae* Gahan.** *Amer. Midl. Nat.* 29, 1943 (180–2). [Virginia Polytechnic Institute, Blacksburg, Virginia.] L.S.

Although biologically the two common Cerambycid beetles, *Cyllene robiniae* and *C. caryae*, are quite distinct (the former breeding in Locust and emerging in the later summer, the latter breeding in Hickory and emerging in the spring) morphologically they are very difficult to distinguish. Investigations showed, however, that they can be distinguished on the basis of wing coloration. An examination of wing venation, pubescence, and chaetotaxy showed no difference in these respects between the species.

13.14 : 13.2 (71.3–4) : 45.3 : 12.25. MCDUNNOUGH, J. **Notes on the early stages of two *Eupithecia* species (Lepidoptera).** *Canad. Ent.* 74, 1942 (202–3). I.I.E.

Brief notes are given on the life history of *Eupithecia filmata* Pears. taken from Spruce, and on larval differences in what are considered by the author to be two closely related species of *Eupithecia*,—*E. gibsonata* Tayl. (*chagnoni* Swett), which feeds on Cedar (*Thuja occidentalis*), and *E. arceuthata* Fr. which feeds on Juniper (*Juniperus virginiana*).

13.15 : 13.2. FLANDERS, S. E. **An additional observation on the biology of *Erynnia nitida*.** *J. econ. Ent.* 35, 1942 (607). R.A.E. A31 (203).

Recent observations confirmed the author's opinion that larvae of the Tachinid, *Erynnia nitida* R.-D., which overwinter in adults of the Elm leaf beetle (*Galerucella luteola*, Müll.) cannot complete their development until the beetles have begun to feed in spring. Dissection of one of 22 overwintered beetles collected in California on 13th April, 1942, showed that *Erynnia* had overwintered as a first instar larva. The rest of the beetles were fed on fresh Elm leaves in an outdoor cage, and on 4th May a mature larva of *Erynnia* was removed from one of them; this pupated the following day, and a female emerged on 21st May. Since oviposition by the overwintered beetles began on 3rd May, it appears that, under field conditions, adults of *E. nitida* emerge only when host larvae of the spring generation are available for oviposition.

13.15 : 13.2. FOX-WILSON, G. **The harvesting of Alder Buckthorn (*Rhamnus frangula*) and the effect on the insect fauna.** *Proc. R. ent. Soc. Lond.* (*Series A, General Entomology*.) 17, 1942 (112). I.I.E.

The recent extensive cutting of *Rhamnus frangula* to ground-level on commons in southern and southeastern England gives an opportunity for the study of the effects of the removal of the host plant on the monophagous brimstone butterfly (*Gonepteryx rhamni* L.) and the aphid, *Aphis rhamni* Boyer (*A. abbreviata* Patch), which is monophagous during the winter phases of its life-cycle.

13.15 : 13.2. HOPPING, G. R. **Apparent negative geotropism in the Douglas Fir bark beetle.** *Canad. Ent.* 74, 1942 (205). I.I.E.

A small-scale experiment to discover whether the habit of the Douglas Fir bark beetle, *Dendroctonus pseudotsugae* Hopkins, of projecting its galleries from the entrance holes towards the top of the tree were due to negative geotropism or to some structural or physiological factor in the tree, showed that the position of the entrance holes with regard to the upper or lower side of the log did not seem to influence the beetles to any appreciable extent, and that galleries were projected upwards or downwards following the general direction of the grain. It is concluded that the beetles have a tendency to follow the structure of the wood, while exhibiting at the same time a negative geotropic response under normal circumstances.

13.15 : 13.2 : 45.3 : 12.26–8 (79.4). KEIFER, H. H. **Eriophyid studies XII.** *Bull. Calif. Dep. Agric.* 31 (3), 1942 (117–29). R.A.E. A31 (208).

This paper includes an account of female dimorphism in *Oxypleurites aesculifoliae*, which causes rusting of the leaves of Buckeye (*Aesculus californica*) in California.

13.15 : 13.2 (71.4) : 45.3 : 12.25 : 13.19. MARTINEAU, R. **Population studies of the European Spruce sawfly (*Gilpinia hercyniae* Htg.) in Quebec.** *Contr. Dep. Lands For. Quebec* (*Ent. Serv.*) No. 19, 1943. pp. 23. *Repr.* from *For. Chron.* 19 (2), 1943.

Population studies of the Spruce sawfly (*Gilpinia hercyniae* Htg.) were made in Spruce stands (Black Spruce, White Spruce, and a mixed stand) in the Gaspé Peninsula and the Matapedia Valley regions of Quebec Province. Results indicated that the emergence of the adult from the cocoon is affected by the thickness of the humus layer, 4–6 in. being the ideal for maximum emergence. Sunlight and moist habitats appear to favour the emergence of adults. Natural agencies in the control of the sawfly included mice, shrews, and squirrels. Of 645,580 cocoons found within the limits of the plots 60·4 per cent. were chewed by these predators. During the period in which the studies were

made parasites were much less important as a control factor than the rodents.

13.15 : 13.2 (71.4). PAQUET, G. **Bioclimatic study of the European Spruce sawfly in Quebec.** *Contr. Dep. Lands For. Quebec (Ent. Serv.)* No. 20, 1943. pp. 20. *Repr.* from *Rev. canad. Biol.* 2 (2), 1943.

A study was made to determine the date of cocoon formation of the European Spruce sawfly in the Province of Quebec in order to provide an index of the relative suitability of the various regions and localities for the development of the sawfly.

13.15 (76.4) : 12.19.4 : 22.11. LAY, D. W., and TAYLOR, W. P. **Wildlife aspects of cutover Pine woodland in eastern Texas.** *J. For.* 41, 1943 (446–8).

This paper discusses briefly the changes taking place in plant and animal succession following the clear-cutting of virgin timber on areas in eastern Texas.

13.2. *Special [Systematic] Zoology*

13.2 (72 : 728 : 729 : 81 : 85 : 86 : 89). BLACKMAN, M. W. **New species of bark beetles (Pityophthorini) from Mexico and tropical America (Coleoptera, Scolytidae).** *Proc. U.S. nat. Mus.* 92, 1942 (177–227 + plate). O.R.S.

Forty-three new species of Pityophthorini are described from the following genera:—*Thamnophthorus* Schedl, *Neodryocoetes* Eggers, *Myeloborus* Blackman, *Spermophthorus* Costa Lima, *Pityoborus* Blackman, *Pityophthorus* Eichhoff, *Gnathotrichus* Eichhoff, and the new genus *Pityophthoroides*. *Neopityophthorus* Schedl is considered by the author as a subgenus of *Neodryocoetes*.

13.2 (72 : 729 : 73 : 86) : 45.3 : 31.43. BLACKMAN, M. W. **New genera and species of bark beetles of the subfamily Micracinae (Scolytidae, Coleoptera).** *Proc. U.S. nat. Mus.* 93, 1943 (341–65 + plate). O.R.S.

Two new genera and 16 new species of the subfamily Micracinae are described, 1 genus and 11 species from the continental United States, and 1 genus and 5 species from the West Indies, Colombia and Mexico. As far as is known, all species breed in the bark or wood of deciduous trees or shrubs. Trees that are decadent, dying, or recently dead, as well as broken or cut limbs and twigs, commonly serve as breeding places. The proper development of lignivorous forms depends on whether the wood infested is in proper condition for the nourishment of the larvae. This involves a sufficient amount of moisture and the presence of rapidly developing fungi. In Hickory, a favoured host, decay of the sapwood is extremely rapid when warmth and moisture are sufficient.

None of the species of Micracinae breeding in bark is known to be strongly injurious, but attack by species of the lignivorous genera *Hylocurus*, *Micracis*, and *Thysanoes*, has resulted in definite injury. *Hylocurus langstoni*, a species common in the southeastern States, often attacks living trees through injured or deadened areas of the bark, sometimes extending the injury until the tree is killed. Posts and poles set in the soil before they are thoroughly seasoned are liable to a type of injury similar to that caused by powder-post beetles.

13.2. BLACKMAN, M. W. **New genera and species of Neotropical bark beetles (Coleoptera: Scolytidae).** *J. Wash. Acad. Sci.* 33, 1943 (34–8). [U.S. Bureau of Entomology and Plant Quarantine.] L.S.

Two new genera of Neotropical bark beetles, *Gnatholeptus*, n. gen. and *Tachyderes*, n. gen., belonging to the subfamily Ipinae, tribe Pityophthorini, are described. *Gnatholeptus* contains two and *Tachyderes* three previously undescribed species.

13.2. RUSSELL, L. M. **A classification of the scale insect genus *Asterolecanium*.** *Misc. Publ. U.S. Dep. Agric.* No. 424, 1941. pp. 322 + plates. [U.S.D.A. Bureau of Entomology and Plant Quarantine.]

2. SILVICULTURE

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.1. *Light and Temperature Requirements*

21.11 : 12.25. SHIRLEY, H. L. **Is tolerance the capacity to endure shade?** *J. For.* 41, 1943 (339–45). [Allegheny Forest Exp. Sta., Philadelphia, Pa.]

A review of the reaction of Jack Pine, Red Pine, White Pine, and White Spruce seedlings to nutrient deficiency, to drought, and to heat, as well as of their rate of growth following release from suppression, their rate of root penetration, and their first-year survival on the forest floor, reveals that none of these is a measure of or directly related to their relative survival beneath dense forest canopies or their position in succession toward the climax. Survival of these species under forest canopies of the Lake States and their rank in the successional series are dependent primarily upon 'shade tolerance', which has been defined as the ability of seedlings to survive in light of low intensity. Relative shade tolerance can be tested by determining the number of years (or months) seedlings will survive when exposed to 2 to 8 per cent. of total sunlight. The omnibus concept of tolerance as the ability to withstand all deficiences arising from competition is no longer tenable because the implied parallelism in tolerance of various deficiencies does not exist. To avoid confusion the term 'tolerance' should be used only with reference to a specific site factor. *Author's summary.*

21.6. *Behaviour in the Stand*

21.6 : 12.26–8 : 12.25 : 32.1. GEVORKIANTZ, S. R., RUDOLF, P. O., and ZEHNGRAFF, P. J. **A tree classification for Aspen, Jack Pine, and second-growth Red Pine.** *J. For.* 41, 1943 (268–74). [Lake States Forest Exp. Sta.]

The tree classification is applicable to Jack Pine, Aspen and second-growth Red Pine in northern Minnesota. It is based on (1) tree vigour as shown by position and relation of the tree to surrounding trees and crown density, (2) soundness, (3) form, and (4) utility. Close relationships are shown between tree vigour, as used in the classification, and growth, defect, and root development. Practical applications of the classification are pointed out and illustrated.

21.6 : 12.25 : 32.1. KEEN, F. P. **Ponderosa Pine tree classes redefined.** *J. For.* 41, 1943 (249–53). [U.S. Bureau of Entomology and Plant Quarantine, Berkeley, Calif.]

In an earlier article the author proposed a tree classification based on age and crown vigour for determining the susceptibility of Ponderosa Pines to bark-beetle attack [cf. *J. For.* 34, 1936 (919–27).] The present article redefines the tree classes on the basis of a study of an additional 3,700 trees. [Cf. *For. Abstr.* 2 (250), 4 (193, 255).]

21.61 : 12.14.3 : 12.25 : 11.47.1. DAVIS, S. H. **Root distribution studies.** *Bull. Morris Arbor.* 4, 1942 (27–8). L.S.

Studies on the lateral root distribution of some conifers contradict the view commonly expressed in older literature that the mycorrhizal or feeding roots of trees are to be found localized in an area which is in general covered by the 'drip' from the outer edges of the crown spread. Recent investigations show that the area of mycorrhizal abundance varies with species and individuals and may be anywhere from the root crown to a considerable distance beyond the edge of the crown spread. Data are given for specimens of *Pinus nigra austriaca* and *Cedrus atlantica*. Results of measurements of root spread should discourage the continuance of the band method of fertilizing in favour of more exact determination of the general lay-out of the root system, particularly before the application of slow-moving fertilizers such as phosphorus.

21.64 (42.1–8) : 12,26–8 : 11.11.2. PARKIN, J. ***Eucalyptus gunnii* and its lack of hardiness.** *Gard. Chron.* 113 (third series), (2923), 1943 (4). O.B.D.

As a result of recent severe winters in the British Isles only one out of 19 trees of *Eucalyptus gunnii* raised by the author 19 years ago from Essex seed now remains alive.

21.8. *Phenology*

21.8 (54.87) : 12.14.7. HOLMES, C. H. **Flowering and fruiting of forest trees of Ceylon—I, II, III.** *Indian For.* 68, 1942 (411–20, 488–99, 580–7).

Since 1936 data have been collected in Ceylon on the flowering and fruiting of forest trees. These included:– dates of observations, local and botanical names of the species recorded, whether flowering or fruiting, and remarks on the condition of flowers or fruit. The observations extended up to the end of 1940. Reasonably definite and dependable information was collected on 31 species, which represent all the principal climatic and vegetational zones of Ceylon, except the subtropical wet evergreen forests of the hill country.

21.9. *Longevity*

21.9 : 12.25 : 56.02 : 11.11.4. SCHULMAN, E. **Over-age drought conifers of the Rocky Mountains.** *J. For.* 41, 1943 (422–7). [Laboratory of Tree-Ring Research, University of Arizona, Tucson, Ariz.]

Extremely long life, especially of Douglas Fir and Piñon Pine, is found to be widely associated with very slow growth in an apparently adverse environment. This paper reports the finding of two trees of exceptional age—a Piñon Pine and a Douglas Fir each 860 years old. A growth curve is given showing a radial life history of the latter.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.14.1 (54) : 23.24. **The method of compensatory plantations in selection forest.** *Sylva* No. 22, 1941–42 (11). [Working Plans Division, Bengal Forest Service.]

It is pointed out that the selection system often fails in practice because valuable species do not always regenerate naturally in the openings made by selection fellings but are frequently replaced by valueless fast-growing species. The alternative of clear felling followed by artificial regeneration is not always possible. Where it is believed that natural regeneration of the desired species will be inadequate, compensatory plantations should be established to make up for the timber removed in selection fellings. The minimum amount of regeneration required would be based on the number of trees necessary to provide an amount of timber at rotation age at least equal to the amount available in the original crop. It would thus be necessary to fix some relation between volume removed and area regenerated, such as one acre of plantation per so many cubic feet felled.

22.89 : 12.25 (942) : 76.3. COSSART, S. J. **South Australian Pine plantations: a wonderful achievement.** *Aust. Timb. J.* 8, 1942–43 (1021, 1023).

A note on the State plantations of *Pinus radiata* in the Mt. Gambier district, managed on a rotation of 25–30 years. These plantations have proved an exceedingly profitable investment.

22.89 : 12.26–8 (729.5). WADSWORTH, F. H. **The Las Cobanitas Campeche plantation.** *Carib. For.* 4, 1943 (140–3). [E.sp.] [Tropical For. Exp. Sta., Rio Piedras, Puerto Rico.]

Notes on a plantation of *Haematoxylon campechianum* established in Puerto Rico in 1924.

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

23.1 : 12.25 (42.1–8). LUTTREL, A. **Note on natural regeneration of Hemlock Spruce (*Tsuga albertiana*) on the Dunster Castle Estate in west Somerset.** *Quart. J. For.* 37, 1943 (97).

A group of Hemlock Spruce planted in 1904 has done well, some of the trees being now 70–80 ft. high. Ample natural regeneration is becoming established in the neighbourhood of the group among Oak and young Larch.

23.1 : 12.26–8 (410). URQUHART, B. P. **Regeneration of Sycamore.** *Quart. J. For.* 37, 1943 (89–91 + plate).

Notes, based on the writer's observations, on the natural regeneration of this species in Britain.

23.2. *Artificial Regeneration*

23.21. Choice of Species

23.21 (68.1) : 12.26–8. BECHUANALAND. **Annual report of the Department of Forests for the year ended 31st December, 1942.** [Department of Forests, Bechuanaland.] 1943. pp. 3.

Species that are showing promise in experimental plantations include *Eucalyptus rostrata, E. paniculata, E. melliodora*, and *Casuarina cunninghamiana* (p. 1).

23.21 (79.4) : 12.26–8 : 21.2. MILLER, E. W. **Eucalyptus for difficult conditions.** *J. Calif. hort. Soc.* 3 (1), 1942 (46–7). Biol. Abstr. 17 (17146).

Thirteen species of *Eucalyptus* are growing in the dry hills of Solano County, California.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.15 : 12.25 : 12.26–8. MARRERO, J. **A seed storage study of some tropical hardwoods.** *Carib. For.* 4, 1943 (99–105). [E.sp.e.] [Tropical For. Exp. Sta., Rio Piedras, Puerto Rico.]

The tests described led to the following conclusions:– (1) seed of *Cedrela mexicana* can be preserved satisfactorily for at least 8 months by storage at about 35° F. in either sealed or unsealed containers; (2) seed of *Swietenia macrophylla* retains satisfactory viability for at least one year when stored at the same temperature, preferably in sealed containers; (3) the storage of the seed of *Hymenaea courbaril* presents no problems during the first year but refrigeration is advisable if storage for longer periods is intended.

23.23.15 : 12.26–8. UMLAND, C. B. **Freezing of Black Gum seed increases nursery production.** *J. For.* 41, 1943 (452). [Tennessee Valley Authority.]

Black Gum (*Nyssa sylvatica*) seed that was frozen in a block of ice for 60 days and then kept in cool, moist storage for 40 days until sown gave earlier germination and better growth and yield of seedlings than untreated seed that had been kept in dry storage.

23.23.19 : 12.26–8. CHATURVEDI, M. D. **Germination of Teak seed.** *Indian For.* 68, 1942 (457).

A method is described for hastening the germination of Teak seeds by spreading them on a 1-inch-thick layer of coarse sand resting on loosely packed grass and twigs over a brushwood foundation, and then covering the seed with a thin layer of rich forest soil. The bed is soaked with water every evening. Germinating seeds are easily pulled out of the sand and transplanted.

23.23.19 : 12.26–8. **Germination of seeds: Tulip Poplar.** *Amer. Nurserym.* 77 (9), 1943 (28).

One of the main reasons for the poor germination of Tulip Poplar seeds is that, on an average, only a little over 10 per cent. of the seeds contain embryos. Moreover, the lack of proper treatment before sowing accounts for additional failures. Investigations have shown that maximum field germination and highest seedling production during the first year are obtained by stratifying the seeds in moist peat moss for 4½ to 6½ months at a temperature of 36° to 40° F. prior to sowing in the spring. Seedling production by fall-sown seeds was highest in the second year. Early October sowing followed by a mulch resulted in an increase in the number of first-year fall-sown seedlings, but the spring sowing of stratified seeds produced a higher total germination. A field germination of 4 to 6 per cent. is considered satisfactory for this species.

23.23.19 : 12.26–8. NEW YORK STATE. **Cornell University Agricultural Experiment Station. Fifty-fifth annual report, 1942.** Ithaca, New York. [1942?]. pp. 192.

A mechanical method for removing the pericarps from Basswood seeds has been devised whereby the possibilities of early germination are increased (p. 136).

23.23.19 : 12.26–8 410). **Hardwood seed selection.** *Quart. J. For.* 37, 1943 (114–5).

It is suggested that valuable seed trees and stands, especially Oak, should be exempted from felling during the present war and preserved to satisfy future requirements for good strains of seed.

23.23.3. *Methods of Sowing*

23.23.3 : 12.25 : 23.23.19. ZIMMER, W. J. **A transect study of the flight of seeds of the Murray Pine.** *Vict. Nat.* 59, 1942 (142–3). O.R.S.

Natural regeneration of Murray Pine (*Callitris glauca*) in Victoria is rare. The data obtained from the present investigation, which was made on an area protected with rabbit-proof fencing, showed that where broadcast sowing is necessary in order to establish timber on denuded areas, the primary belts should be sown about 8 chains apart and in proper relation to the topography and soil types of the region. Deep covering of the seeds is undesirable; it was found that seeds sown at depths of ½ to 3 in. had sufficient energy for the cotyledons to reach the soil surface, although the percentage of success dropped considerably with 3-in. sowing. The average fertility of Murray Pine seed was found to be about 33 per cent.

23.23.3 : 12.25 : 45.12 : 13.2. MCKEEVER, D. G. **Direct seeding of Western White Pine using poisons for rodent control.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 18, 1942. pp. 6.

Results from tests in direct sowing of Western White Pine, using a poisoning method for rodent control developed by the Fish and Wildlife Service, indicate that this method can be of practical and economic value in establishing reproduction of this species in large-scale sowings on the better sites.

23.23.3 : 12.25 : 45.12 : 13.2. MCKEEVER, D. G. **Results of direct seeding of Ponderosa Pine in the northern Rocky Mountain region.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 20, 1942. pp. 6.

Trials in the direct seeding of Ponderosa Pine were successful when seed spots were protected from rodents by conical wire screens during the first growing season. On some sites the screening of the seed spots after germination occurs is an advantage in protecting young seedlings from animals and from excessive heat and in reducing transpiration and evaporation from the soil. While an experiment to control seed-eating animals by poisoning instead of screening was unsuccessful owing to the destruction of seedlings by grasshoppers, it is believed that when these insects are not numerous this method will result in satisfactory stocking at less cost than by planting. [Cf. *For. Abstr.* 1 (257), 2 (132).]

23.23.3 : 12.25 : 45.12 : 13.2. MCKEEVER, D. G. **Results of direct seeding of Western Redcedar and Engelmann Spruce in the northern Rocky Mountain region.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 21, 1942. pp. 9.

Spot sowing with Western Red Cedar (*Juniperus virginiana*) and Engelmann Spruce (*Picea engelmanni*) in the fall without rodent protection gave moderate success on favourable sites. Seedlings of both species are rather exacting as to site conditions, require surface soil moisture, and are easily lost through erosion. When covered with a thin layer of soil the seed of these species does not appear to be attractive to rodents, and in sowing the seed should be placed on and covered lightly with mineral soil. Steep slopes, narrow creek bottoms and gullies are not suitable for seeding with these species.

23.23.3 : 12.25 : 45.1–2. KEYES, J., and SMITH, C. F. **Pine seed-spot protection with screens in California.** *J. For.* 41, 1943 (259–64). [U.S. Fish and Wildlife Service, Chicago, Ill.]

This paper discusses the construction, cost, field use, and effectiveness of wire domes, which give excellent protection to seed spots against seed-eating birds and small mammals in northern California. The effectiveness of the method is increased by the use of rapidly germinating seed, e.g. stratified seed. Limitations of the method due to weather and large animals are discussed, and the effects on light and temperature are briefly indicated.

23.23.3 : 12.26–8 : 23.23.12. WADHWANI, B. B. **Artificial regeneration of Babul (*Acacia arabica*) in Sind.** *Indian For.* 69, 1943 (112–6).

The seed of Babul (*Acacia arabica*) is most conveniently and economically collected from sheep and goat pens and when collected in this way it germinates earlier and gives a higher percentage of success than when collected directly from the pod.

In the dry tracts of Sind artificial regeneration may be attempted either before the annual Indus floods (which occur between April and November and reach their peak by mid-August), or while the flood water is still present but is on the decline, or after the flood water has receded. There are 7 main methods of sowing, which are used either singly or in combination:—(1) by broadcast sowing, (2) by dibbling, (3) by furrows, (4) by patches, (5) by strips, (6) in trenches, and (7) by agriculture-cum-forestry. Brief notes are given on each of these methods. Mound sowing has been abandoned as although the seeds germinate well the mounds quickly dry up with the decline of the water and the seedlings, not having tapped subsoil moisture, die of drought.

23.24. Formation of Stands by Planting

23.24. PRESTON, J. F. **Notes on tree planting of the Soil Conservation Service.** *J. For.* 41, 1943 (285–7). [U.S. Soil Conservation Service.]

By the end of 1941 about 635 million trees had been planted by the Soil Conservation Service on 550,000 acres. Country-wide averages for the species used are Black Locust 17 per cent., other hardwoods 23 per cent., and conifers 60 per cent. There are 48 genera in the hardwood group and 10 genera in the coniferous group, including 19 species of Pine. Comparison of the type of planting in 1941 with that in 1937 is shown by the following percentage figures, those for 1937 being in brackets:—gullies 15 (28), fields 58 (60), tree windbreaks 15 (2), and wildlife 12 (10).

23.24 : 12.26–8 : 23.26 : 23.23.19. DEOGUN, P. N. **How to grow Shisham (*Dalbergia sissoo*).** Mercantile Press, Lahore. [n.d.] pp. v + 13 + plate. [Montgomery Forest Division.]

Dalbergia sissoo is one of the most important Indian trees. It is of value as a shade tree for avenue and canal-bank planting, is one of the best furniture timbers and also provides fuelwood. This pamphlet describes up-to-date nursery practice for the propagation of the species by seed, the methods and conditions best suited for planting, and the latest method of plantation irrigation.

Information is given on the amount of seed required, the number of stumps obtainable per acre of nursery, weight of stumps, etc.

23.24.2. *Methods of Planting*

23.24.2 : 12.26–8 : 23.23.3 : 11.62.11. IOWA. **Report on agricultural research for the year ending June 30th, 1942. Part I. Projects reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa. 1942. pp. 1–18, 65–6, 93–112, 149–58, 183–8, 253–93.

Experiments in establishing Black Locust on eroded loam, using four different treatments on the contour —unfurrowed scalped, unfurrowed mulched, furrowed scalped and furrowed cultivated—showed that preparation of the soil by ploughing before planting resulted in much better growth than that on unploughed soil. Heavy mulch strips on the contours appeared to give much the same result as ploughing. Direct seeding of Black Locust in ploughed contour strips gave significantly better results than the planting of nursery-grown seedlings of the same seed source (pp. 154–5).

23.26. Plant Rearing. Nursery Practice.

23.26.4 : 11.47.13 : 12.25. LYNCH, D. W., DAVIS, W. C., ROOF, L. R., and KORSTIAN, C. F. **Influence of nursery fungicide-fertilizer treatments on survival and growth in a Southern Pine plantation.** *J. For.* 41, 1943 (411–3).

The treatments included ferrous sulphate and phosphoric acid applied in solution separately or in combination at the rate of a fraction of an ounce per sq. ft. of nursery seedbed following sowing. The present paper describes an experiment to test the hold-over effects of the treatments in a forest plantation of Loblolly, Shortleaf, and Slash Pines. Measurement of height growth and survival at the end of the first and second years after planting showed that:—(*a*) Height growth of Loblolly Pine was not affected by the chemicals, while relatively high mortality of seedlings of this species was associated with all treatments containing phosphoric acid. (*b*) All treatments increased the height growth of Shortleaf Pine seedlings during the first but not during the second year after planting; mortality in this species was relatively high for the two most concentrated treatments irrespective of the chemical. (*c*) Untreated seedlings of Slash Pine were distinctly taller than treated seedlings in both the first and second years after planting; mortality for this species was high throughout and it was not possible to detect any significant effects due to the treatments.

23.26.4 : 11.47.13 : 11.43.1 : 12.25. IOWA. **Report on agricultural research for the year ending June 30th, 1942. Part I. Projects reports, publications, staff, financial statement.** Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa. 1942. pp. 1–18, 65–6, 93–112, 149–58, 183–8, 253–93.

An experiment was undertaken to determine the effect on the development of seedlings of Douglas Fir and White Pine of various fertilizer treatments of nursery soil and of soil inoculation with humus containing mycorrhizal fungi. The following results are noted:—

(1) On uninoculated soil both White Pine and Douglas Fir showed large and significant responses to phosphorus. Responses to nitrogen were smaller and significant only for Douglas Fir.

(2) On inoculated soil neither species showed statistically significant response to fertilizers.

(3) With White Pine, soil inoculation promoted growth equally as well as fertilizer. With Douglas Fir the plants from inoculated soil were superior to those in fertilized but uninoculated soil.

(4) With both species best development was obtained on inoculated soil treated with peat and complete fertilizer [P (1,000 lb.) + N (150 lb.) + K_2SO_4 (300 lb.)]. Such seedlings were not markedly superior to those grown in inoculated check plots.

(5) With White Pine the application of fertilizers to uninoculated soil was followed by formation of mycorrhizae, the presence of which could not be detected by external examination. Mycorrhizae from plants in fertilized uninoculated soil were strictly ectotrophic while those of plants in unfertilized inoculated soil were ectendotrophic.

(6) External examination of Douglas Fir short roots from fertilized uninoculated soil did not reveal a fungal mantle and it was not determined whether these roots were mycorrhizal. On these plants the number of swollen short roots increased with increasing phosphate applications and was positively correlated with growth response (pp. 185–6). [Cf. *For. Abstr.* 5 (88).]

23.3. *Afforestation*

23.3 (42.9) : 11.14.3 : 11.34 : 11.49 : 23.21. GODWIN, G. **Afforestation in Glamorgan.** *Quart. J. For.* 37, 1943 (80–7).

Notes on types of land encountered, and species and planting methods employed by the Forestry Commission in western Glamorgan.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

24.22 : 12.26–8. LAL, A. B. **Advance thinning for Teak plantations.** *Indian For.* 68, 1942 (430–5).

The application of ordinary and ordinary-cum-mechanical thinning in Teak plantations has given unsatisfactory results in the past largely because such methods disregard the fact that as Teak is a vigorous root-competitor, the effects of root competition become evident long before crown differentiation takes place; trees may be so seriously weakened before the period of thinning that they may be incapable of response to the extra soil moisture and light when thinning is eventually carried out. Although advance thinning has certain disadvantages, the author considers that these have been exaggerated. The disadvantages of both ordinary and advance thinning are discussed, and an attempt is made to justify preferential use of the latter method

24.22 : 12.26–8. LAL, A. B. **Advance thinning for Teak plantations.** *Indian For.* 69, 1943 (170, 171–3).

A reply to Mr. M. A. K. Khalil's criticism [cf. *For. Abstr.* 5 (32)] of an earlier article by the author [cf. preceding abstract] in which he discussed the potential advantages of advance thinning. Six points are stressed: (1) Although there may be some response to delayed thinning in places where soil-moisture conditions are particularly favourable, this probably does not hold good for average and dry localities owing to earlier competition among the tree roots for soil-moisture. (2) As Teak is a ring-porous wood, slow-grown Teak is likely to be weaker than moderately fast-grown timber owing to the concentration of pore space. It therefore seems desirable to carry out advance thinning on low-quality sites. (3) The cost of pruning Teak is likely to be cheaper in India than is conifer-pruning in Europe. (4) Invasion of Teak plantations by other species through the heavy opening of the canopy is unlikely to occur on average or dry sites owing to the dry condition of the superficial soil layer. The formation of a pure Teak plantation in moist areas, on the other hand, is contrary to proper ecological concepts, but a suitable undergrowth would here be desirable in order to keep the crop and the soil in an active state and control Teak defoliators. (5) Other species should be used to replace Teak where hard laterite has formed owing to clear felling. (6) In the post-war period heavy thinnings will certainly be tried as an aid to accelerate the maturity of the crop.

The application of advance thinning in large-scale practice is not advocated at this stage, but in view of the fact that delayed thinning allows the productivity of the site to be wasted on trees other than crop trees, it is suggested that heavier early thinning should be tried out in experimental areas.

24.3. *Opening of the Canopy. Release and Improvement Fellings*

24.36 : 23.1 : 12.25 : 24.31. DOWNS, A. A. **Response of Eastern White Pine reproduction in the southern Appalachians to liberation.** *J. For.* 41, 1943 (279–81). [Appalachian Forest Exp. Sta., Asheville, N.C.]

Liberation of Eastern White Pine reproduction from a decadent hardwood [Oak, Hickory and Sourwood (*Oxydendrum arboreum*)] overstorey resulted in 17 to 62 per cent. greater height growth than on control plots, with the smaller trees showing greater response. After treatment damage to Pine reproduction by falling limbs or snags was slight.

Half of the hardwoods to be removed were girdled and half poisoned with sodium arsenite. All treated Oak and Hickory were dead at the end of the third year. Poisoned trees, particularly those under 11 in. in diameter, had fewer sprouts per tree than girdled trees. The subsequent Oak and Hickory sprouts were neither numerous nor vigorous enough to endanger the liberated Pine reproduction, whereas Sourwood sprouted prolifically, grew vigorously, and was a menace to Pine reproduction.

24.4. *Shelterbelts. Windbreaks*

24.4 (78.3) : 23.21. KILLAND, T. K. **Hedge plants for the Northern Great Plains.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1898, 1942. pp. 13. [U.S.D.A. Bureau of Plant Industry.]

In order to ascertain the kinds of tree and shrub species that could be used as satisfactory hedge plants under conditions such as prevail on the northern Great Plains area, field experiments were begun by the Northern Great Plains Field Station, Mandan, North Dakota, in 1915 and are still continuing. Notes on the behaviour of over forty species as hedge plants are recorded. These represent the genera *Acer*, *Amelanchier*, *Berberis*, *Betula*, *Caragana*, *Cornus*, *Cotoneaster*, *Crataegus*, *Elaeagnus*, *Fraxinus*, *Lonicera*, *Philadelphus*, *Physocarpus*, *Prunus*, *Rhamnus*, *Ribes*, *Rosa*, *Salix*, *Sambucus*, *Sorbaria*, *Spiraea*, *Syringa*, *Ulmus*, and *Viburnum*. Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*), Box Elder (*Acer negundo*), and Chinese or Siberian Elm (*Ulmus pumila*) are stated to have given best results for high screens or shelters.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0. *General Information on Woods*

31.0 : 12.26–8. *Timber Leaflets* No. 83 and 84, 1943. Timber Development Association, Ltd., 75, Cannon Street, London, E.C.4.

The leaflets of this series give brief notes on names, distribution, tree characters, and qualities, properties, uses and supplies of timber for a tree species or genus. Leaflets 83 and 84 deal with *Ocotea rodioei* and *Abies nobilis*.

31.0 : 12.26–8 : 12.25. **Foreign timbers—I. Notes on Jacareuba (*Calophyllum brasiliense*) and Cedro (*Cedrela* sp.).** *Leafl. For. Prod. Res. Lab.* No. 27, 1943. pp. [2]. [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Brief notes are given on the size, habit and natural habitat of the tree and on the characteristics, properties and qualities of the wood of the two species.

31.0 : 12.26–8. **Facts about Lignum-vitae.** *Pulp Paper Mag. Can.* 44, 1943 (556).

A brief account is given of the properties and uses (particularly in pulp and paper mills) of Lignum-vitae, the timber of *Guaiacum officinale*.

31.0 (81) : 12.25 : 12.26–8 : 12.19. DUCKE, A. **The most important woods of the Amazon valley.** *Trop. Woods* No. 74, 1943 (1–15).

Brief notes are given on the size and appearance, the distribution, and the qualities and uses of the woods of some of the best known tree species of the Brazilian Amazon. These include: *Vouacapoua americana* Aubl., *Swietenia macrophylla* King, *Carapa guianensis* Aubl., *Hymenolobium excelsum* Ducke, *H. petraeum* Ducke, *Pithecolobium racemosum* Ducke, *Myroxylon peruiferum* L.f., *Cedrela odorata* L., *Coumarouna odorata* Aubl., *Torresea acreana* Ducke, *Goupia glabra* Aubl., *Cordia goeldiana* Huber, *Silvia itauba* (Meissn.) Pax, *Dalbergia spruceana* Benth., *Holopyxidium jarana* (Huber) Ducke, *Ocotea barcellensis* (Meissn.) Mez, *Platymiscium trinitatis* Benth., *P. ulei* Harms, *Simaruba opaca* (Engl.) Radlk., *Mimusops huberi* Ducke, *Eschweilera odora* (Poepp.), Miers, *Swartzia cinerea* Ducke, *Euxylophora paraensis* Huber, *Calycophyllum spruceanum* Benth., *Peltogyne* spp., *Zollernia paraensis* Huber, *Mora paraensis* Ducke, *Caryocar villosum* (Aubl.) Pers., *Swartzia laevicarpa* Amsh. *Bowdichia* spp., *Diplotropis* spp. and *Cariniana micrantha* Ducke. Vernacular names are given for each species.

31.1. *Structure. Anatomy. Identification*

31.1 (7 : 8). RECORD, S. J. **Keys to American woods** (continued). *Trop. Woods* No. 74, 1943 (17–43).

[Cf. *For. Abstr.* 4 (230), 5 (34).] Keys are presented for two further groups of American genera:—(6) woods having vessels with scalariform perforation plates; (7) woods having vessels with very fine pitting. In the first group there are 146 named genera of 68 different families; in only slightly more than half of the genera mentioned are the plates exclusively scalariform. In most instances in the second group all of the pits are very small, though occasionally they are associated with larger ones.

31.1 : 12.25 : 12.26–8 : 33.8. CHOWDHURY, K. A. **How to identify timbers. Part III. Timbers for motor lorry bodies.** *Indian For. Leafl.* (*Utilisation*) No. 37, 1943 (17–29). [Forest Research Institute, Dehra Dun.]

This leaflet gives brief anatomical descriptions and a key for the field identification of important Indian timbers used for motor-lorry bodies. These include *Pinus longifolia, P. excelsa, Cedrus deodora, Cupressus torulosa, Grewia* spp., *Pterocarpus marsupium, Dalbergia* spp., *Lagerstroemia* spp., *Tectona grandis, Shorea robusta, Dipterocarpus* spp., *Calophyllum* spp., *Dichopsis* spp., *Artocarpus* spp., *Albizzia* spp., *Terminalia myriocarpa, Amoora* spp., *Hardwickia pinnata, Chukrasia tabularis, Phoebe* spp.

31.1 : 12.26–8. CHOWDHURY, K. A. **How to distinguish between the sapwood and heartwood of Sal (*Shorea robusta*).** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 115, 1942. pp. 3 + plate. [Forest Research Institute, Dehra Dun.]

The best method for distinguishing the heartwood and sapwood of Sal (*Shorea robusta*) is to determine whether tyloses are present in the pore cavities. When they are present the timber is heartwood and when they are absent it is sapwood.

The procedure for detecting tyloses in Sal is described briefly.

31.1 : 12.26–8. FERNANDES, C. S. Da estrutura peculiarissima do cerne de *Schinopsis brasiliensis*. [**The very peculiar structure of the wood of *Schinopsis brasiliensis*.**] *Arch. Inst. Pesquisas Agron.* 3, 1941 (141–7). [Port.] Biol. Abstr. 17 (14371).

Some anatomical structures of Barauna wood (*Schinopsis brasiliensis*) peculiarly filled up with tyloses, like the sclerotic cells of some plants, are shown. The author believes that tyloses are of use in distinguishing this plant from similar ones.

31.1 (96.1–8). PACHECO DE TÔRRES, J. Estudo do lenho de algumas espécies florestais de Timor. [**A study of the wood of some forest tree species of Timor.**] *Rev. agron., Lisboa* 29 (1), 1941 (56–86 + plates.) [Port.] *Abstr.* in *Trop. Woods* 74, 1943 (47).

Detailed descriptions are given of the macroscopic and microscopic features of 13 woods, as follows (vernacular names in parenthesis):—(1) *Parinarium corymbosum* Miq. (Ai Béssi Mutim, Pau Ferro, Pau de Manufai), (2) *Intsia amboinensis* Thouars (Ai Béssi, Pau Ferro), (3) *Pterocarpus blancoi* Merr. (Ai Na, Pau Rosa), (4) *Canarium moluccanum* Bl. (?) (Ai Quiar), (5) *Garuga floribunda* Dcne. (Ai Feu), (6) *Dysoxylum caulostachyum* Miq. (Ai Seria), (7) *Melia dubia* Cav. (Ai Mara), (8) *Dictyoneura* aff. *philippinensis* Radlk. (Ai Cnia), (9) *Pometia pinnata* Forst. (Ai Mara), (10) *Sterculia foetida* L. (Ai Nita), (11) *Calophyllum inophyllum* L. (Ai Sampalo), (12) *Terminalia catappa* L. (?) (Ai Calesse Catapo) and (13) *Memecylon* sp. (?) (Ai Siba).

Each anatomical description is illustrated with photomicrographs of the cross, radial, and tangential sections at 30× or 55×. There are notes on the technical properties and uses of the woods.

31.1 : 07.7. HARLOW, W. M. **Swelling-staining reagent for studying fiber structure.** *Paper Tr. J.* 116 (15), 1943 (52). [New York State College of Forestry, Syracuse, N.Y.] P.R.

Fifty mg. of Ruthenium red were dissolved in 20 ml. of the organic base (50 per cent. aqueous solution) used as a swelling reagent. A drop of this swelling-staining reagent applied to the delignified fibres of Shortleaf

Pine resulted in the brilliant staining of many of the fibres, a considerable contrast being obtained by the use of a green filter. Twenty mg. of the stain in the same amount of solution was found to be nearly as effective as the higher concentration.

31.2. *Physical Properties*

31.2 : 12.26–8 : 33.8. PAUL, B. H. **Black Walnut for gunstocks.** *Sth. Lumberm.* 166 (2089), 1943 (32–6). [U.S. Forest Products Laboratory, Madison, Wis.]

A study was made of the properties of Black Walnut (*Juglans nigra*) timber, particularly of their reaction to changed conditions of growth from virgin to open-grown forest.

On the basis of data obtained from sample trees studied it was found that open-grown Black Walnut was heavier and harder than forest-grown material, and had less variation in green moisture content. No significant differences were found in shrinkage, slope of grain or in the proportion of sapwood to heartwood.

Ratios of average sapwood/heartwood values of tests on specific gravity, shrinkage and hardness were:—

Property	*Ratio of sapwood to heartwood*
Specific gravity—	
Open-grown trees	0·89
Forest-grown trees	0·94
Shrinkage—	
In volume	1·23
Tangential	1·24
Longitudinal	1·63
Hardness (green)—	
End	0·84
Tangential	0·74
Radial	0·80

Moisture content was greater in both heartwood and sapwood near the base of the tree, that in the heartwood being greater than that in sapwood. In the upper portions of the tree moisture content in the sapwood was the greater.

It is concluded that weight specifications for Black Walnut gunstock blanks that eliminate material from near the lower and upper limits of the specific gravity range would result in more uniform gunstock quality.

31.21. Conductivity

31.21.4 : 33.15. MACLEAN, J. D. **The rate of temperature change in wood panels heated between hot plates.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1299, 1942. pp. 19 + figs.

31.21.4 : 33.32. NARAYANAMURTI, D. **The thermal conductivity and other properties of some indigenous materials.** *Indian For. Rec.* (*n.s.*) *Utilisation* 3 (2), 1943. pp. 13 + figs. [Forest Research Institute, Dehra Dun.]

Results from tests on the thermal conductivity and sound absorption co-efficients of various indigenous Indian materials showed that:—(1) For the same density, fibre boards (made from bagasse, immature coconuts and Pine wool) had the least conductivity, bark boards (made from barks of *Erythrina suberosa* and *Euphorbia nivulia*) were intermediate, and wood-wool and sola (*Aeschynomene* sp.) pith boards had the highest conductivity. (2) Wood-wool/casein boards showed the highest sound absorption, bark boards came next and fibre boards were the lowest in this respect.

31.22. Relation to Water, Air, Gases

31.22.1. NUSSER, E. **Determination of the moisture content of wood.** *German Patent* No. 708,045, June 5, 1941 (Cl. 42*l*. 9.51). Chem. Abstr. 37 (2908). P.R.

The moisture content is determined by the electrical conductivity of the sample. Pointed electrodes are inserted on opposite sides to a depth of 10–20 per cent. of the thickness of the specimen.

31.22 : 31.23. [**Moisture content of wood.**] *Aero Res. Tech. Notes Bull.* No. 4, 1943. pp. 6. P.R.

Brief notes are included on the relation between swelling and moisture content of wood, rate of swelling, and increase of moisture content due to gluing. Data are given on suitable values of moisture content of wood for a variety of purposes, and on the specific gravity of dry wood of some of the commoner species.

31.22.1 (54). REHMAN, M. A. **A survey of the seasonal variation of the moisture content of Indian woods.** *Indian For. Rec.* (*n.s*) *Utilization* 2, 1942 (vi + 209–43 + plates). [Forest Research Institute, Dehra Dun.]

The seasonal variations in the moisture content of seasoned timber were studied in a number of places in India with the object of determining the proper moisture content to which wood for interior use in different climatic regions should be seasoned in order to give the least trouble from swelling and shrinking in relation to changes in atmospheric humidity.

From the results of this survey and from a knowledge of the maximum and minimum atmospheric humidities prevailing during the year in different localities, it is possible to divide nearly all of India into four distinct zones with reference to the moisture content to which timbers should be seasoned for interior use. These are as follows:—

Zone	*Moisture content per cent.*
1. Hot dry regions of the Punjab, Rajputana and Sind	7 or 8
2. Moderately hot dry regions of the United Provinces, Bihar and Central India	10
3. Moderately moist parts of Bengal, Bihar, South India and the coastal regions of Sind and Kathiawar	12
4. Very moist regions of Bengal and Assam and most of the coastal regions of the country	13 or 14

Results are given of a laboratory experiment on the equilibrium moisture content of 58 species of timbers at 96 and 30 per cent. relative humidities. The values obtained indicate the seasonal variations in the moisture content of these woods under different climatic conditions.

31.23. Weight. Specific Gravity

31.23 : 01.4. ARTSIKHOVSKAYA, N. V. **A comparison of methods of determining the specific gravity of wood.** *Zavodskaya Lab.* 9, 1940 (1014–9). *Chem. Zbl.* 1, 1942 (1699). Chem. Abstr. 37 (3593). P.R.

The specific gravity of wood is recalculated to a humidity content of 15 per cent. by means of tables;

a volumetric drying coefficient of 0·5–0·6 per cent., depending on the type of wood, is used. If the quality of the wood is not known, this coefficient must be determined with the micrometer by a stereometric method. For nonrectangular samples it is necessary to determine the volume with a Hg volumenometer. The specific gravity must then be determined from another sample to eliminate the effect of the Hg.

31.27. Mechanical Strength

31.27 : 12.25 : 38.2. Dietz, A. G. H. **Stress–strain relations in timber beams (Douglas Fir).** *Bull. Amer. Soc. Test. Mat.* No. 118, 1942 (19–27). [Massachusetts Institute of Technology, Cambridge, Mass.] P.O.

In order to determine the reasons for differences in behaviour of wood, particularly Douglas Fir, in bending and direct stress, tests were made on five beams of edge-grained timber of that species, three at 9 per cent. and two at 24 per cent. moisture content, and on direct-tension and direct-compression specimens cut from the beams. Measurements were made by electrical resistance wire gauges cemented to the sides of the test specimens.

The strain distribution in beams was found to be a curve to well below the proportional limit. All fibres, however, showed linear stress–strain characteristics until the bending proportional limit (well above the direct compression proportional limit) was reached, beyond which all exhibited marked hysteresis. The general features of the Newlin–Trayer theory were confirmed. Theoretical curves of strain variation, closely following the observed variations, were deduced. An explanation is offered for the lower modulus of rupture observed in deep beams as compared with shallow beams. *From author's summary.*

31.27 : 56.02 : 12.26–8 : 22.88 : 22.89. Limaye, V. D. **Interim report on the relation between rate of growth and strength of natural and plantation Teak.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 113, 1942. pp. 13. [Forest Research Institute, Dehra Dun.]

From the limited data available it is concluded that:—(1) There is a significant correlation between the rate of growth and strength of Teak. (2) A rate of growth of about 5 to 6 rings per inch has been found to produce the strongest wood while a growth rate greater than about 4 rings per inch produces very weak timber. (3) Plantation-grown Teak is equal to natural Teak as far as strength is concerned, although it is slightly lighter in weight and faster grown. It is emphasized that further investigations are required before final conclusions can be drawn.

31.27 : 33.8. Markwardt, L. J. **Aircraft woods: their properties, selection, and characteristics.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1079, 1941. pp. 51 + tbls. + graphs. *Repr.* from *Rep. nat. advis. Comm. Aeron.* 354.

Strength values of various woods for aircraft design for a 15-per-cent. moisture condition of material and a 3-second duration of stress are given, and various factors affecting these values are discussed. The toughness-test method of selecting wood is discussed and a table of acceptance values for several species is included.

Information is given on the properties of various native species of wood compared with Spruce, and the characteristics of a considerable number of them are discussed from the standpoint of their possible application in aircraft manufacture to supplement the woods now commonly used. Chief among the species that may be considered with Red, Sitka, and White Spruce for use in highly stressed parts, such as wing beams, are Alaska Cedar (*Chamaecyparis nootkatensis*), Port Orford Cedar (*C. lawsoniana*), Southern Cypress (*Taxodium distichum*), Douglas Fir, Noble Fir (*Abies noblis*), Western Hemlock, Northern White Pine, Norway Pine (*Pinus resinosa*), Sugar Pine (*P. lambertiana*), Western White Pine (*P. monticola*), Yellow Poplar (*Liriodendron tulipifera*), and Engelmann Spruce.

31.27 : 33.15 : 12.26–8 : 38.1. Norton, N. A. **Strength properties of air-dry laminated Yellow Poplar beams and columns.** *Res. Pap. Pa. St. For. Sch.* No. 6, 1943. pp. 11.

Standard tests for static bending and compression parallel to the grain on laminated Yellow Poplar (*Liriodendron tulipifera*) beams and columns, made from $\frac{1}{8}$-in. rotary-cut veneer, show that the laminated wood gives higher values for the properties determined by these tests, except work to the proportional limit, than does normal Yellow Poplar wood. However, comparisons are less favourable when made on the basis of strength/weight ratios; it is suggested that as the weight of glue increases the specific gravity of the material, the glue spread should be kept as low as is consistent with good gluing technique.

The effect of the position of the veneer, whether vertical or horizontal to the direction of load, was not significant in these tests except for the property total work, which was on the average 31·4 per cent. higher for beams on which the load was applied to the faces of the veneers; this indicates superior toughness and shock resistance.

31.3. *Chemical Properties*

31.3. Browning, B. L. **Chemical testing methods literature review.** *Paper Tr. J.* 116 (11), 1943 (31–3). P.R.

A brief review of the literature on the chemical analysis of wood, pulp and paper for the period March 1942 to February, 1943.

31.3. Brookbank, E. B., Brauns, F. E., Lewis, H. F., and Buchanan, M. A. **New derivatives of lignin.** *Paper Tr. J.* 116 (13), 1943 (27–8). P.R.

Using the commercially available lignin, Meadol, as a raw material, the authors have prepared an extensive series of esters of mono- and dibasic aliphatic acids, as well as esters of several aromatic acids. Twenty-six compounds have been described.

31.3 : 33.39. Bertrand, G., and Brooks, G. Sur le methanol contenu dans le bois et dans les tissus lignifiés. **[Methyl alcohol in wood and in lignified tissues.]** *C.R. Acad. Sci. Paris* No. 210, 1940 (773–6). [F.] Biol. Abstr. 17 (12264).

All lignified tissues tested readily yielded small quantities of methyl alcohol on being hydrolyzed by alkali. The wood of trees indigenous to France yielded 0·14–1·3 per cent. From straw of various cereals, and from textile fibres, the shells of nuts, and from all other more or less lignified substances the methyl alcohol obtained varied from 0·03 to 0·22 per cent. The alcohol was not obtained from cotton fibres. For all trees the wood of the branches yielded more than that of the trunk. Vasculose and lignol, often confused under the inexact term lignin, did not yield methyl alcohol under the

conditions of the experiments. The methyl alcohol obtained probably came from the methylic esters in wood and other lignified substances, and these esters result from the transformation of pectic substances in the tissues.

31.3 : 12.26–8. HELLSTRÖM, N. **The action of alkali on wood. II.** *K. norske vidensk. Selsk. Forh.* 13 (12), 1940 (50–3). *Chem. Zbl.* 1, 1941 (1759). Chem. Abstr. 37 (2573). P.R.

The amount of substance dissolved from Birch wood by solutions of NaOH was found to depend only upon the concentration of the NaOH and the temperature and to be independent of the duration of treatment, the ratio wood/volume of NaOH, and the number of repeated NaOH treatments. At room temperature the solubility reaches a maximum at a NaOH concentration of 4 per cent.

31.3 : 12.26–8 : 34.24. ŠTASTNÝ, J. **The chemical composition of the solutions obtained by leaching wood with water and alcohol with special consideration to the determination of Oak tannin.** *Sborn. ces Akad. Zemědelské* 16, 1941 (477–83). *Chem. Zbl.* 1, 1942 (2489). Chem. Abstr. 37 (3219–21). P.R.

During an investigation of the influence of different woods on the ageing of alcoholic products the author determined the substances that go into aqueous-alcoholic solutions during extraction. Tannic acid was the main substance obtained, especially in the case of Oak wood. Extracts of Oak, Ash and Beech wood were prepared by boiling for a maximum of 6 hours with alcohol of various concentrations. Ash and Beech, as compared with Oak, yield only a small amount of extract and contain very little tannin.

31.3–4 : 33.36.1. MATAGRIN, A. **The composition of wood and the principal methods of wood preservation. I, II, III.** *Rev. Chim. indust., Paris* 49, 1940 (123–6, 171–83, 239–51). *Chem. Zbl.* 1, 1942 (436). Chem. Abstr. 37 (2536). P.R.

Parts I and II present a summarized account of the more important constituents of wood such as cellulose, lignin, carbohydrates, N compounds, resins, tannins and dyestuffs, and of agents destructive to wood, such as abnormal temperatures, chemicals, lower and higher plant and animal organisms. Part III gives a comparison of the various methods for wood preservation and stresses the necessity of employing effective chemicals. The various physical and chemical requirements are outlined. The author gives prominence to the newer methods of wood impregnation.

31.4. *Durability. Decomposition*

31.4 : 12.25 (79.7) : 42.1. BUCHANAN, T. S., and ENGLERTH, G. H. **Deterioration of Olympic wind thrown timber.** *Timberman* 44 (8), 1942–43 (24, 26, 28, 30).

Data are given on the causes and rate of deterioration in timber of Douglas Fir, Sitka Spruce, Western Red Cedar, Western Hemlock and Pacific Silver Fir (*Abies amabilis*) following the blowdown on the Olympic Peninsula of Washington in 1921. [Cf. *For. Abstr.* 3 (240–1).]

31.41. *Natural Durability*

31.41 : 12.26–8 : 31.42.11 : 12.21. HEMMI, T., AKAI, S., and OHNO, H. **A study on the relative resistance of the Beech wood to decay.** *Ann. phytopath. Soc. Japan* 10 (4), 1941 (304–16). R.A.M. 22 (188).

In the writers' experiments under controlled conditions on the relative resistance of Beech (*Fagus crenata*) wood to 16 wood-destroying fungi, Hubert's designations of 'decay durability' and 'decay resistance' for the length of service of wood and its relative resistance to decay, respectively, were adopted. The test blocks of wood were inserted into flasks containing agar cultures of *Polystictus hirsutus. P. sanguineus, Polyporus rhodophaeus, P. orientalis, P. patouillardii, P. mikadoi, P. schweinitzii, P. betulinus, P. sulphureus, Ganoderma applanatum, G. lucidum, Irpex consors, Stereum frustulosum, S. induratum, Fomes pinicola,* and *Trametes dickinsii,* and kept there for 320 days at 24° C. The mycelia of *P. mikadoi, P. orientalis, P. patouillardii, G. applanatum,* and *G. lucidum* formed distinct zone lines at their points of contact with the glass walls of the flasks.

The most severe decay was caused by *P. mikadoi* and the least by *S. frustulosum,* the losses in the average dry weight of the blocks exposed to these two fungi being 60·92 and 11·15 per cent. respectively. Losses in dry weight in the test blocks were not correlated with the luxuriance of mycelial growth on them. Apart from *P. mikadoi,* the agents of white pocket rot were usually characterized by sparse mycelial growth and caused slight loss in weight of Beech wood; they caused the formation of pockets deep in the wood. In the case of *Polystictus hirsutus* and *P. sanguineus,* the optimum temperatures for the mycelial development of which are much greater than those in the experiments under discussion, there was extensive rotting of the surface of the blocks, accompanied by fairly high losses of weight, but the central tissues of the wood remained almost sound. *Polyporus orientalis* and *P. schweinitzii,* which normally occur on Pines and other conifers in Japan, induced the formation of white pockets and a brown cubical rot, respectively, in the Beech test blocks.

31.41 : 12.26–8. SCHRAMM, J. R. **An experiment in greenhouse benches.** *Bull. Morris Arbor.* 4, 1942 (25–6). L.S.

Air-seasoned wood of Shipmast Locust (*Robinia pseudoacacia* var. *rectissima*), which is known to be highly resistant to decay, was used in the construction of greenhouse benches without preservative treatment.

31.42. Attack by Plant Organisms

31.42.11 : 12.21 : 33.36.3. SCHEFFER, T. C., and CHIDESTER, M. S. **Significance of air-dry wood in controlling rot caused by *Poria incrassata.*** *Sth. Lumberm.* 166 (2091), 1943 (53–5). [U.S.D.A. Bureau of Plant Industry.]

Results from experiments have shown that *P. incrassata* will rarely remain alive in air-dry wood for more than a month, and in general the survival period will be much shorter, particularly if the moisture content of the wood is below about 15 per cent. Good air drying should eliminate *P. incrassata* in most cases, but it is emphasized that in a region where the fungus occurs, lumber should be kept dry.

31.42.11 : 12.21 : 12.25. SOUTHAM, C. M., and EHRLICH, J. **Effects of extracts of Western Red Cedar heartwood on certain wood-decaying fungi in culture.** *Phytopathology* 33, 1943 (517–24). [University of Idaho, Moscow, Idaho.]

In order to test the toxicity of water-soluble extractives of Western Red Cedar to various fungi, the

extractives were removed at 100° C. from sawdust and mixed in various concentrations with malt-agar media on which the following 11 species of fungi were then planted:—*Coniophora puteana*, *Fomes officinalis*, *F. pinicola*, *F. roseus*, *Lentinus lepidius*, 'Madison 517', *Polyporus schweinitzii*, *P. sulphureus*, *Poria xantha* forma *crassa*, *Trametes serialis*, and *T. subrosea*. Results showed that in the case of certain fungi, extreme dilutions of the extract resulted in a temporary increase of growth. Any considerable concentration of the extract, however, retarded the rate of growth of all the fungi tested, and still higher concentrations completely prevented growth. When removed to an ordinary malt-agar medium after the test period, some non-growing planting pieces of *Fomes officinalis*, *F. roseus*, *Lentinus lepideus*, 'Madison 517', and *Polyporus schweinitzii* resumed growth, showing that in these cases the toxic extract had been fungi-static but not lethal. The other fungi appeared to be dead. Further experiments showed that by growing some of the fungi on gradually increasing concentrations of the extract they could be made to adapt themselves to fairly high concentrations that would normally have proved lethal.

31.42.11 : 12.25 : 12.26–8 : 12.21 : 33.36.1 : 33.31. KAUFERT, F. H., and BEHR, E. A. **Susceptibility of wood to decay: effect of urea and other nitrogen compounds.** *Industr. Engng. Chem.* (*Industr. Ed.*) 34, 1942 (1510–5). L.S.

The results of laboratory studies reported in this paper indicate that, under conditions favourable to decay, rate of decay and susceptibility to decay of Southern Pine sapwood, Douglas Fir heartwood, Red Oak heartwood, and Cypress heartwood were not appreciably affected by the addition of low concentrations of urea and ammonia compounds. While small concentrations of the organic nitrogen compounds, asparagine and peptone, increased the rate of decay of Southern Pine sapwood and Red Oak heartwood, it is suggested that this effect is of little practical significance.

Concentrations of urea and ammonium compounds approaching those used for chemical seasoning or fire-proofing wood prevented growth of wood-rotting fungi on the test blocks of all woods. However, under conditions favourable to decay the nitrogen compounds appear to be easily and completely removed from the wood by leaching. Although heating of urea-treated wood to 70–100° C. for 12–14 hours appears to fix some of the urea in the wood so that it is difficult to remove by leaching, it has not been established that such heating takes place under present kiln-drying practices.

31.43. Attack by Animal Organisms

31.43 : 13.2 : 38.2. **Preventing damage to buildings by subterranean termites and their control.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 1911, 1942. pp. 37. [Bureau of Entomology and Plant Quarantine, U.S.D.A.]

This bulletin deals mainly with the prevention of termite infestations, particularly by means of correct building practices. Information is given on sanitation, structural and chemical control measures, on the characteristics and distribution of termites and on conditions favouring infestation by these insects.

31.43 : 13.2 : 38.2. UNITED STATES. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 60.

Laboratory experiments have shown that the most effective shields for use against the eastern subterranean termite (*Reticulitermes flavipes*) are of durable metal giving a smooth surface with thin edges. The outer edge of the shield must be at least 2 in. from any object in contact with the building, shields must be continuous with all joints smoothly soldered, and holes cut in the shields for anchor bolts must be sealed with coal-tar pitch. It is pointed out that shields must be inspected annually for termite tubes. On the recommendation of the Bureau of Entomology and Plant Quarantine, termite shields have been omitted from practically all recent construction for the Army, Navy and Federal Public Housing Authority (pp. 14–5).

31.43 : 12.25 : 13.2 : 33.36.1. BECKER, W. B. ***Prionus laticollis* (Drury) in a subterranean wooden duct for telephone cables.** *J. econ. Ent.* 35, 1942 (608). R.A.E. A31 (204).

The failure of a telephone line in Massachusetts in September, 1941, led to the discovery of three large larvae of *Prionus laticollis* in one side of an underground wooden telephone duct made of Southern Pine that had been installed in 1930. The lead covering on the cable inside the duct had a hole chewed through it at the point where the wood was infested, as a result of which moisture had entered the cable and caused a short circuit. The duct had been treated with creosote before installation, but in the injured section the infested side contained little or none of the preservative. Examination of the growth rings in the wood showed that it came from the centre of the tree, and therefore contained heartwood, which does not absorb creosote so well as sapwood; in addition, leaching may have taken place, though the other side of the duct was well impregnated and showed no insect injury. The injury occurred at a depth of 3 ft. under lawn in sandy soil containing no roots of trees or shrubs, though a tree had been removed several years before. A somewhat similar case, caused by larvae of the same species, occurred in a neighbouring town the year before, but in the vicinity of trees and shrubs.

31.43 : 13.2. LINSLEY, E. G. **A further note on wood-boring by the drugstore beetle.** *J. econ. Ent.* 35, 1942 (701). R.A.E. A31 (246).

The author records an instance of wood-boring by larvae of *Sitodrepa* (*Stegobium*) *panicea*, L.; the pellets of wood that filled the burrows were similar to those of the California death watch beetle, *Hadrobregmus gibbicollis*, Lec.

31.8. *Quality and Defects of Timber*

31.8 : 12.25 (79.8) : 32.81. JOHNSON, H. M. **Recovery of aero quality lumber from Alaska Spruce logs.** *Timberman* 44 (7), 1942–43 (56–7, 64). [Pacific Northwest Forest and Range Exp. Sta.].

Data on log scale, defect, overrun, and lumber-grade recovery for Alaska Spruce (*Picea sitchensis*) logs were obtained from a mill-production study. These data and comparable figures for the yield of aero-quality lumber from Oregon and Alaska Spruce logs are tabulated. The average yield of aero-quality lumber from Alaska Spruce, all log grades, was 19·2 per cent., the yield from individual grades being: peeler log—41·4, No. 1—23·3, No. 2—9·2, and No. 3—6·5 per cent.

31.8 : 31.27 : 31.23 : 12.25 : 12.26–8. HESS, R. W. **Problems affecting the use of wood in aircraft.** Curtiss-Wright Corporation, Buffalo, N.Y. April, 1943. pp. 13. P.R.

The following measures are proposed to encourage the use of wood in aircraft:—

1. Wood quality improvement:

(*a*) Segregration of wood (including veneers) into more restricted specific gravity groups.

(*b*) Reduction of veneer and plywood tolerances.

(*c*) Complete control of wood moisture content through all stages of manufacture.

2. Basic data analysis:

(*a*) Study of available strength data of all wood species to determine accurately the various species offering advantages where particular stresses are dominant.

(*b*) Utilization of these woods to obtain greater strength/weight efficiency.

3. Structural design data accumulations:

(*a*) To conduct the necessary tests for determining the basic structural design data that have not yet been determined for native American wood species. These include Young's moduli (3), shear moduli (3), Poisson's ratios (6), ultimate and yield strengths for various angles to the grain, and typical stress/strain curves.

(*b*) To advance the wood aircraft designs as rapidly as possible, digressing as far from the 'conventional' as is necessary to use wood in the most efficient manner.

Thirty-five of the more common and abundant species in use in the United States (including Balsa and African Mahogany) were tested and the ratios of their various strength properties to their weights (specific gravity) are presented in numerical sequence.

32. HARVESTING OF WOOD. LOGGING

32.2. *Felling and Related Operations*

32.29 (71). RIPLEY, P. O., ARMSTRONG, J. M., and KALBFLEISCH, W. **Land clearing.** *Fmrs.' Bull. Dep. Agric. Can.* No. 111, 1942. pp. 43. [Division of Field Husbandry, Dominion Experimental Farms Service, Ottawa.] A.P.B.

This bulletin presents fairly detailed information, well illustrated, on the clearing and disposal of timber and brush from the land, methods and equipment used in removing stumps, the disposal of stumps, types of power machinery used for land clearing, uses and cost of explosives and methods of blasting, the removal of stones and hummocks, the preparing of cleared land for the production of field crops, and the cost of clearing land. The information presented has particular reference to Canadian requirements.

32.9. *Transport*

32.91.22 : 07.7. **Hydraulic preloading system for log trucks.** *Timberman* 44 (7), 1942–43 (12–3).

The system of preloading is illustrated by a series of photographs. The apparatus used consists of four hydraulic jacks, a Ford V-8 motor and two false bunks.

32.93.1 : 07.7. KELLY, J. L. **Drag line arrangement for sweeping pulpwood from banks of lakes.** *Pulp Paper Mag. Can.* 44, 1943 (516–7).

Experiments were made in moving stranded pulpwood from the lake shore by means of a drag line with rake attachment (10 ft. wide and 3 ft. high) operated from a scow on which a 45-ft. boom was installed. A three-drum winch operated by a petrol motor was used to raise or lower the boom and to haul the incoming and outgoing cables. Alternatively, instead of hauling in the drag line to the scow, the latter, including the boom and a rigidly attached rake, was drawn from the shore by a line anchored in the lake. Equipment of this type was found to be most suitable for use on banks or shoals free from obstructions such as rocks or stumps.

33. CONVERSION AND PRESERVATION OF WOOD

33.0. *Utilization Categories of Wood*

33.0. **Partial list of uses of forest products in substitutions for steel and tin.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1289, 1942. pp. 7.

33.02. Pulpwood and Chemical Wood

33.02 : 31.22.1 : 33.32. MORRIS, W. S. **Mechanical pulping of wood: effects of moisture content of wood on grinding.** *Pulp Paper Mag. Can.* 44, 1943 (501–8). [Pulp & Paper Research Institute of Canada.]

Results from the investigation described indicate (*a*) the effect of the moisture content of wood on grinding operation and pulp characteristics, and (*b*) the difference in behaviour of wood of Black and White Spruce, Balsam Fir and Jack Pine under similar grinding conditions.

33.02 : 12.25. SCHAFER, E. R., and PEW, J. C. **The grinding of Engelmann Spruce for newsprint and magazine quality mechanical pulps.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1407, 1942. pp. 2 + tbls.

This report compares the grinding characteristics of Engelmann Spruce and White Spruce for newsprint and magazine quality pulps.

33.06. Fuelwood (including Firewood, Charcoal Wood, and Producer Wood)

33.06 : 07.7 : 34.6. GRAIFF, G. L. **If you want increased capacity and efficiency in wood burning furnaces.** *Power* 87 (4), 1943 (74). *Steam Engng.* 12, 1943 (308). Fuel Res. Summ. 1943 (287). P.R.

The results of tests with various mixtures of sawdust and hogged wood waste are given, and the influence and value of different forms of grates, primary and secondary air supplies and firing systems are discussed. A suggested conical water-cooled grate secures uniform bed thickness and nearly uniform resistance to air flow.

33.06 : 12.14.8. HELLEMANS, A. H. W. **Tan bark as a [boiler] fuel.** *Brennstoff u. Wärmewirts.* 25, 1943 (29–30). [G.] Fuel Res. Summ. 1943 (244). P.R.

Tan bark contains 59·3–65·9 per cent. water, 1·1–1·3 per cent. ash and 32·9–39·5 per cent. combustible material, and has a calorific value of 1,073–1,446 kg. cal. per kg. Boiler test data when using coal and coal/tan bark (1 : 1) are tabulated.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.12. Furniture and Cabinet Making

33.12. **Precision woodworking.** *Wood* 8, 1943 (124–8).

An illustrated note on the manufacture of wooden

telephone switchboards at the works of Ericsson Telephones, Ltd.

33.13. Cooperage. Shingles

33.13. JOHNSON, R. P. A. **Wood tanks.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1285, 1942. pp. 17 + plates.

Redwood, Douglas Fir and Cypress supply about five-sixths of the tank stock used in the United States. Southern Yellow Pine, Cedar and White Oak are also of commercial importance, while White Pine and other species are used occasionally.

This publication discusses the timber-grade requirement for tank stock and the use of wood in tanks required by food industries, brewers, textile industries, tanneries, and for processing soap, cleaning fluids and candles, and for the storage of water.

33.13. KELLY, J. A. **Barrel notes.** *Indian For.* 69, 1943 (123–5).

Directions are given for the manufacture of barrels, and a method is recommended for effectively sealing the joints of wet-coopered turpentine barrels. Treatments for whisky, coconut-oil and wine barrels are outlined.

33.13 (729.7) : 12.26–8. SMEATHERS, R. **The manufacture of shingles from local woods in Trinidad and Tobago.** *Carib. For.* 4, 1943 (107–11). [E.e.sp.]

Notes on methods and costs based on recent experience.

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. **Glue spread.** *Aero Res. tech. Notes, Bull.* No. 5, 1943. pp. 4. P.R.

Brief notes are given on the measurement of glue spread, the amount of glue required, and the use of low tension electric gluing for large areas.

33.15. **Resin adhesives for plywood: Tego, Amberlite, Uformite.** The Resinous Products & Chemical Company, Philadelphia. 1942. pp. 88. *Bull. Inst. Paper Chem.* 13, 1943 (257). P.O.

33.15. BAKELITE, LTD. **Improvements in or relating to the impregnation of wood with resin.** *British Patent* No. 549,335. Build. Sci. Abstr. 16 (n.s.), 1943 (187). P.R.

A process for the treatment of wood or woody material with resin, by which the material is soaked in water to remove soluble salts, is then soaked in an aqueous solution or dispersion of synthetic resin and, without introducing any precipitating agent, is dried.

33.15. COLT, E. W., and CORNWELL, E. D. (to Armour & Co.). **Adhesive suitable for uniting plies of wood, cloth, etc.** *U.S. Patent* No. 2,307,198, Jan. 5, 1943. Chem. Abstr. 37 (3534). P.R.

A blood albumin-glue-hexamethylene-tetramine adhesive is prepared containing 23–35 per cent. of glycerol on a dry basis.

33.15. LOUGHBOROUGH, W. K. (to Henry A. Wallace, as Secretary of Agriculture of the U.S.A., and his successors in office). **Impregnating and plasticizing wood.** *U.S. Patent* No. 2,298,017, Oct. 16, 1942. Chem. Abstr. 37 (1576). P.R.

Wood such as layers for plywood manufacture is impregnated with an aqueous solution of urea or thoiurea or both, dried, then heated to at least 150° F., deformed as by a bending machine or press, and then cooled.

33.15. LÜTY, W. (to The Licoro Corp.). **Reinforced sheeted adhesives suitable for use in plywood manufacture.** *U.S. Patent* No. 2,304,263, Dec. 8, 1942. Chem. Abstr. 37 (2848). P.R.

An arrangement of apparatus is described, and a process of manufacture is employed which involves coating a foraminous metal sheet with a liquid phenol-CH_2O condensation product capable of setting under the application of heat and pressure, the holes of the sheet being too large to be closed by a film of the condensation product, applying a thin sheet of porous fibrous tissue on at least one side of the metal sheet while the condensation product is still liquid, the tissue sheet being capable of absorbing a film of the condensation product serving to cover the holes, whereby a continuous film of the condensation product is formed extending over the entire surface of the metal sheet, thereby producing a reinforced sheeted adhesive which can be stored without becoming tacky and used for uniting sheets of plywood upon the application of heat and pressure with the production of a bond having substantially the strength of the wood itself.

33.15. MACDERMOT, J. G. **Self-bonding glues permit use of low pressure in gluing.** *B.C. Lumberm.* 27 (4), 1943 (65).

A brief note on the development of self-bonding glues including, first, the self-bonding casein glues, which give a bond of highest strength properties under conditions of minimum pressure on the joint, and, second, the self-bonding synthetic resin glues, which can be used to produce completely waterproof joints under similar conditions of low pressure.

33.15. NARAYANAMURTI, D., RANGANATHAN, V., and IKRAM, M. **Studies on adhesives. Part III. Casein glues.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 116, 1943. pp. 21. [Forest Research Institute, Dehra Dun.]

The commercial method of preparing casein, the chemistry and properties of casein glues, the preparation of casein glue-bonded plywood, and experiments on the production of plywood adhesives from casein are described and several glue formulas are given. It was found that:—(1) All the formulas studied (irreversible type) gave satisfactory dry and wet strengths. (2) There was no great difference in the adhesive strength of the glue prepared with different grades of lime, silicate and water (in U.S. laboratory formula) provided proper amounts of lime and silicate were used. (3) The casein manufactured in India gave good dry and wet strengths. (4) Santophen (pentachlorophenol) does not adversely affect the water resistance of the glue (in U.S. laboratory formula), and its use for making casein-bonded durable plywood is indicated. *From authors' summary.*

33.15. NARAYANAMURTI, D., and RANGANATHAN, V. **Studies on adhesives. Part V. A preliminary note on cold-setting urea-fromaldehyde resin adhesives.** *Indian For. Leafl.* (*Utilisation*) No. 41, 1943. pp. 6.

Results from a limited number of glue-joint and plywood tests indicate that satisfactory adhesives of the cold-setting urea-formaldehyde resin type, stable in syrup form for a few months, could be produced in India.

33.15. NEBESAR, R. J. **Moulded plastic plywood in aircraft.** *Timber of Canada* 3 (8), 1943 (17–21, 29). *Repr.* from *Modern Plastics*, Feb., 1943.

The main difficulties in the use of wood in aircraft have been concerned with:—(*a*) the durability of wood bonded with vegetable and animal glues, (*b*) the uniformity and interchangeability of individual parts for mass production, (*c*) the durability of finishes, and (*d*) weight control. These difficulties have been largely overcome by the recent developments in materials and methods which are discussed in this article. Examples are given of the use of moulded plastic-bonded veneer and woods in aircraft construction.

33.15. Walsh, J. D. **Plane cooking.** *B.C. Lumberm.* 27 (5), 1943 (26–7).

A brief account is given of a process of moulding plastic plywood and of the properties and uses of this product. The process makes use of a vacuum bag of cellophane which facilitates inspection of the assembly before it is placed in the autoclave and also helps to make efficient use of the heat that is required for the polymerization of the wood and the synthetic resin adhesive.

33.15. Wood, D. M. **Adhesives suitable for gluing wood veneers, etc.** *U.S. Patent* No. 2,297,340, Sept. 29, 1942. Chem. Abstr. 37 (1532). P.R.

Adhesives are formed which contain a proteinaceous vegetable seed flour such as soybean flour or casein or soluble blood albumin together with 0·1–1 per cent. of a sulphated product of the condensation reaction of fatty acids containing a predominant amount of C_{12} and C_{14} acids and monoethanolamine, resulting in an increased spreadability, working life, strength and water resistance of the adhesive, and a water-soluble sulphate of Zn or other metal of groups 3, 4 and 5 of the Fresenius system in the amount (which may be about 2 per cent. or more) also to increase the water resistance, strength, spreadability and working life of the adhesive. U.S. 2,297,341 relates to otherwise generally similar adhesives containing, instead of the sulphated product of the condensation reaction of the fatty acids, etc., and monoethanolamine, a secondary alkyl sulphate containing 12–17 C atoms. Numerous examples are given.

33.15 (54). Kapur, S. N. **A note on the manufacture of plywood in India.** *Indian For. Rec.* (*n.s.*) *Utilisation* 2, 1942 (pp. iv + 245–92). [Forest Research Institute, Dehra Dun.] P.R.

A comprehensive review of the subject of plywood manufacture in India. This bulletin includes information on the prospects of the industry, imports of plywood into India, plywood factories in India, areas suitable for the plywood industry, timbers for plywood, glues, veneer cutting, and the manufacture of plywood and plywood tea chests; it also discusses the machinery required for a plywood mill, and manufacturing costs. Appendices are:—(1) Timbers considered suitable for the manufacture of plywood. (2) Timbers not likely to be suitable for the manufacture of plywood by the rotary method. (3) (i) Imports of plywood and laminated board, other than veneers, for match boxes; (ii) imports of wooden tea chests. (4) Manufacturers and dealers of casein in India. (5) Manufacturers of machinery for the plywood industry. (6) Bibliography.

93.15 : 12.26–8 : 12.25. **Plywood (hardwood and Eastern Red Cedar). Commercial standard CS 35–42** U.S. National Bureau of Standards. (Second edition) 1942. pp. 24.

This standard provides minimum specifications for four grades of hardwood plywood made with three different types of bondage having a high, moderate, and low resistance to moisture. It covers tests, standard thicknesses, widths and lengths, tolerances, workmanship, packing, inspection, and nomenclature and definitions.

33.15 : 12.26–8. Azam, M. A. **Wood veneers.** *Plastics Trends* 2 (17), 1942 (6–8). Chem. Abstr. 37 (3243). P.R.

Absorption data are given for Birch and Poplar immersed in soluble phenolic resins.

33.15 : 12.26–8. Millan, T. **Swelling of Poplar veneer during and after phenolic-resin impregnation.** *Plastics Trends* 3 (3), 1943 (5–6). Chem. Abstr. 37 (3528). P.R.

33.15 : 31.27 : 12.26–8. **Strength data of moulded Birch plywood angles.** Pacific Veneer Company Ltd., Braid St., New Westminster, B.C. 1943. pp. 3. P.R.

33.15 : 12.26–8 : 31.27. Bittner, J. Häufigkeitsuntersuchungen an Flugzeugsperrhölzern. **[Frequency tests on aircraft plywoods.]** *Holz* 6, 1943 (18–9). [G.g.] P.R.

From a large number of tests on the tensile strength, parallel and at right angles to the direction of the fibres, of plywoods made from Canadian Birch, it is concluded that this timber is only slightly superior for plywood manufacture to German-grown Beech and eastern European Birch, both of which had been tested previously.

33.15 : 31.27. Egner, K. Festigkeit von aus kunstharzverleimten Brettern zusammengesetzten geraden und gebogenen Balken. **[Strength of straight and curved beams made from boards joined with synthetic resin glues.]** *Holz* 4, 1941 (49–64). [G.g.] P.R.

Preparation and testing of specimens from such beams are described and data are presented on their behaviour under the influence of external forces.

33.15 : 31.27. Goland, M., and Aleck, B. **The veneer orientation for plywood plates with optimum resistance to buckling.** *Res. Rep. Curtiss-Wright Corp.* No. 55–57, 1943. pp. 41. P.R.

33.15 : 12.26–8 : 31.27 : 31.25 : 31.22. Gordon, L. V. **The use of aqueous-alcoholic Bakelite lacquers in the production of plastic plywood masses of the Lignofol type.** *Lesokhim. Prom.* 3 (7), 1940 (17–9). *Chem. Zbl.* 1, 1941 (1479). Chem. Abstr. 37 (1529). P.R.

As a rule alcoholic Bakelite lacquers are used for the impregnation of pressed wood. This requires the use of apparatus for the recovery of the alcohol. Experiments in which aqueous alkali was used as a substitute for the alcohol showed such substitution to be successful for the production of plastic wood masses of the Lignofol type. The lacquer was prepared from 100 parts phenol, 105 parts 40-per-cent. formalin, and 1 part NaOH at about 100°. The yield was 181 per cent. referred to the phenol. It was treated with about 216 parts water and 4 parts NaOH to give a product containing 31·3 per cent. resin and 1·54 per cent. NaOH. Thin layers of Birch wood 30 × 10 cm. were impregnated with this solution by immersion for 24 hours in the cold. The wood absorbed 75–100 per cent. of its weight of lacquer, with the composition of the lacquer remaining practically unchanged. The impregnated wood was then dried at 60–70° and subjected to a pressure of 275 kg./sq. cm. at 145° for 4 minutes per mm. of thickness of the wood. The following properties are reported for this product and for wood

impregnated with alcoholic lacquer:—resistance to compression 1570 and 1647 kg./sq. cm. respectively; resistance to cleavage 183 and 178 kg./sq. cm.; transverse strength 99 and 130 kg.-cm./sq. cm.; hardness 27 and 26 kg./sq. mm.; absorption of water in 100 hours 1·6 and 2·1 per cent.; swelling 0·5 and 0·4 mm.

33.15 : 33.36.3. TAYLOR, J. P. **Heating wood with radio frequency power.** *Repr.* from *Trans. Amer. Soc. mech. Engrs.* Oct. 1942. pp. 13 + plates. [RCA Manufacturing Company, Inc., Camdon, New Jersey.] P.R.

This illustrated review deals with various aspects of the subject including equipment used, method and effect of application, costs, and advantages and limitations of the process. Examples of typical installations are given.

33.15 : 33.8. RISHELL, C. A. **Laminated construction interests boatbuilders.** *B.C. Lumberm.* 27 (6), 1943 (67). [National Lumber Manufacturers' Ass.]

The possibilities of using laminated boat keels, stems, frames, etc., are discussed. Two types of waterproof glue are suitable for such construction—the cold setting urea type and the hot press or thermal setting type. Requirements in the use of these glues are noted.

33.15 : 33.8. ALLWARD, G. A. **Plywood in aircraft construction.** *Wood* 8, 1943 (121–3). [Condensed from a paper read at the Annual Meeting of the American Society of Engineers.]

After a discussion on the subject with special reference to the selection and gluing of veneers and the utility and weathering properties of plywood, the conclusion was that 'instead of being merely a temporary substitute for metal, plywood promises to become a serious competitor in the commercial airplane field following the war'.

33.15 : 33.8. GREAT BRITAIN. **High strength plywood for aircraft.** *British standard specification for aircraft material* No. 6V.3. July 1943. pp. 23. British Standards Institution, 28, Victoria Street, London, S.W.1.

The specification gives detailed requirements for grades of plywood, e.g. (1) Grade A for 3-ply only and intended for special uses; (2) Grade B for 3-ply other than that covered by Grade A, and also for multi-ply.

The four parts of the specification deal with:—(1) Species of timber and quality of veneer; (2) construction of boards; (3) general provisions applying to all plywood; (4) testing. Appendixes are:—(A) Description of timber characteristics. (B) Standard thicknesses of boards. (C) Method of determining moisture content. (D) Method of determining resistance to moisture.

33.15 : 38.2. **New wood for airscrews.** *Timber of Canada* 3 (11), 1943 (23–7).

A brief illustrated account is given of the operations involved and equipment used in the manufacture of aeroplane propellers from the compressed, impregnated wood product Hydulignum. [Cf. *For. Abstr.* 4 (236).]

33.15 : 38.62. **No critical materials in Armco laminated wood piping.** *B.C. Lumberm.* 27 (6), 1943 (59).

Laminated blocks are assembled crib-fashion to form an octagonal pipe which has high strength qualities. All connexions are made by wooden dowels without the use of steel bands, nails or any other metal reinforcements.

33.17. Sawmilling

33.17. TELFORD, C. J. **Small sawmill improvement . . . practical pointers to field agencies. Methods of loading lumber at the rear of the mill.** *B.C. Lumberm.* 27 (4), 1943 (39–40). [Forest Products Laboratory, Madison, Wis.]

Methods for the orderly handling of lumber between the sawmill and the storage pile are described briefly. One of these methods could be suited to any of the various types of small mills, the choice for an individual mill depending on production volume. The methods described are the lumber prop, inclined platform and rollers, loading scaffolds, sliding skids, and trucks and rails.

33.17 : 12.25. FLURRY, J. E. **Suggestions for sawing a 48-inch Douglas Fir log.** *W. Cst. Lumberm.* 70 (6), 1943 (30, 93).

Suggestions, illustrated by a diagram, are given to help sawmill operators to produce large quantities of high-grade ship decking and pontoon and aircraft lumber from Douglas Fir logs.

33.3. *Chemical Treatment*

33.3. FRIESE, H. **Nitration of wood and straw.** *German Patent* No. 708,237, June 5, 1941 (Cl. 78*c*. 6). Chem. Abstr. 37 (2935). P.R.

Wood or straw is treated at not over 40° with a mixture consisting of HNO_3 approximately one-third by volume and the rest Ac_2O and (or) H_3PO_4 or P_2O_5 with an addition of glacial AcOH. The quantity of HNO_3 used is at least 1·5 but not over 5·5 times the quantity of the material treated.

33.32. Pulp and Paper Manufacture. Plastics

33.32. HÄGGLUND, E., and BERGEK, T. Über die Bedeutung der Spangrösse für die Sulfitzellstoffkochung. **[On the importance of the size of chips for sulphite pulp cooking.]** *Holz* 4, 1941 (64–7). [G.g.] [Zentrallaboratorium der schwedischen Zelluloseindustrie, Stockholm.] P.R.

The tests described tend to disprove the view that the use of long chips in sulphite pulp cooking leads to a high yield and quality of pulp. Spruce chips only 15–20 mm. in length gave higher yields than those of about 35 mm. length, and dry short chips gave a pulp of better strength than dry long chips.

33.32. LAUER, B. E. **Fibrous Raw Materials Testing Committee report, 1942.** *Paper Tr. J.* 116 (11), 1943 (32–4). P.R.

Mainly a brief survey of the literature appearing in 1942 on various aspects of the work of the committee.

33.32. MASON, W. H., and BOEHM, R. M. (to Masonite Corp.). **Tough products such as press boards or laminated material, from ligno-cellulose, etc.** *U.S. Patent* No. 2,303,345, Dec. 1, 1942. Chem. Abstr. 37 (2578). P.R.

A process is employed which involves subjecting a ligno-cellulosic material, such as Gum-wood chips, in relatively small pieces to the action of steam at a temperature of 200° or higher and corresponding pressure for a time which is approximately 35 minutes at 200° to approximately 10 seconds at 285°, and reducing the steam-heated material to fineness, and which involves adding to the ligno-cellulose material

to be steam-treated salt of acid weak enough to be replaced by the acetic acid developed by the steam treatment of the ligno-cellulose and to buffer the developed acid, and to limit the attack thereof upon the ligno-cellulose material, whereby a predominantly plastic material is obtained which is adapted to be converted under heat and pressure into tough products.

33.32. MONTONNA, R. E., and CORNELL, L. W. (to the Board of Regents of the Univ. of Minnesota). **α-Cellulose.** *U.S. Patent* No. 2,301,314, Nov. 10, 1942. Chem. Abstr. 37 (2180). P.R.

A method is employed for producing α-cellulose of high quality and uniform viscosity which involves treating comminuted hardwood with HNO_3 of 5 per cent. or less strength for about 24–30 hours at a temperature of 68–80°, then steaming the treated material for about 45 minutes, rinsing and adding 2 per cent. NaOH and cooking for about 2 hours, then preliminarily bleaching by use of Cl in an amount of about 0·6–2 per cent. of the weight of the air-dried pulp, then treating the pulp with about 9–10 times its dry weight of 6–10 per cent. NaOH for 10–20 minutes at room temperature, and finally bleaching for approximately 2 hours by using NaOCl about 0·15–0·3 per cent. of the dry weight of the pulp.

33.32 (43.1–5). CORRENS, E. Über die Herstellung von Zellstoffen mit hohem Reinheitsgrad an Cellulose. **[On the production of cellulose of a high degree of purity.]** *Cellulosechemie* 19, 5, 1941 (105–13). [G.] P.O.

A review of recent German work on the subject.

33.32 : 01.6. **List of publications on pulp and paper.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*444, 1942. pp. 31.

33.32 : 07.7. LUND, H. **Mechanical disintigrator of wood for the production of fibres.** *German Patent* No. 720,190, April 2, 1942. (Cl. 55*a*. 3.01). Chem. Abstr. 37 (2182). P.R.

33.32 : 07.7. CHAPLIN, M. P. (to Chaplin Corp.). **Apparatus for classifying fibers (such as wood fibers for papermaking) by screening.** *U.S. Patent* No. 2,301,201, Nov. 10, 1942. Chem. Abstr. 37 (2182). P.R.

Various structural, mechanical and operative details.

33.32 : 12.25. DREYFUS, H. (to Celanese Corp. of America). **Cellulose production, as from Spruce chips.** *U.S. Patent* No. 2,299,132, Oct. 20, 1942. Chem. Abstr. 37 (1868). P.R.

A process is employed which involves impregnating lignin-containing cellulosic material with HNO_3 of substantially less than 10 per cent. concentration under conditions (suitably at 40–60°) such that the lignin is substantially unattacked, concentrating, to at least 10 per cent., the acid in contact with the material, as by evaporation of water so that the HNO_3 attacks the lignin, and removing the lignin reaction products by treatment with an alkali.

33.32 : 12.25. KELLER, E. L., and MCGOVERN, J. N. **Sulfite pulping of Engelmann Spruce.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1408, 1942. pp. 7 + tbls. + gphs.

Sulphite pulps covering a range of bleach requirements of 8–24 per cent. standard bleach powder were prepared from Engelmann Spruce (*Picea engelmanni*) using standard pulping conditions. The pulps showed normal variation with degree of pulping; their strength values were not appreciably higher than those generally obtained from White Spruce (*P. glauca*).

33.32 : 12.25 : 34.6. SCHRADER, O. H. **The softening effect of saturated steam under pressure and steaming time on Western Hemlock and Sitka Spruce.** *Repr.* from *Pacif. Pulp Paper Ind.* Feb., 1943. pp. 4. [University of Washington, Seattle.]

The softening of Western Hemlock and Sitka Spruce wood by steaming it at pressures of 25 to 100 lb. per sq. in. is, after ten minutes' exposure, roughly proportional to the steam pressure. During the first ten minutes of steaming the softening effect is greater for the higher pressures. Steaming times in excess of fifteen to twenty minutes are not economically desirable. Although specific gravity is an important factor effecting the hardness of these woods under normal conditions, it is of relatively slight importance when the wood is subjected to the action of saturated steam under high pressures. The recovery in hardness after the release of the steam pressure is very rapid.

33.32 : 12.25. SCHWARZ, R., and HENNIG, T. (to Zschimmer & Schwarz Chemische Fabrik Dölau). **Mechanical wood pulp from resinous wood.** *German Patent* No. 707,894, May 29, 1941 (Cl. 55*a*. 1.10). Chem. Abstr. 37 (2935). P.R.

To the water in which the wood is pulped are added substances which saponify the rosin but do not precipitate it and substances which form insoluble rosin soaps.

33.32 : 12.25. SHELDON, L. M. (to the Cellulose Research Corp.). **Cellulose pulp from resinous wood.** *U.S. Patent* No. 2,300,733, Nov. 3, 1942. Chem. Abstr. 37 (2182). P.R.

A process for the pulping of chips of fresh Southern Pine wood is described.

33.32 : 12.26–8. JAYME, J., HINDENBURG, K.-G., HARDERS-STEINHÄUSER, M., and BRANSCHEID, F. Über die Eignung ein- und zehnjährigen Pappelholzes zur Zellstoffgewinnung. **[On the suitability for pulp manufacture of one- and ten-year-old Poplar wood.** *Holz* 6, 1943 (1–16). [G.g.] [Institut für Zellstoff- und Papierchemie, Darmstadt.] P.R.

A report of investigations on the fibre morphology, chemical properties of the wood, and pulping qualities of 1-year-old shoots of *Populus serotina* and 10-year-old wood of *P. tremula villosa*. The latter, pulped after barking, proved very satisfactory and superior to Beech wood in the manufacture of sulphate and sulphite pulps, both bleached and unbleached. Barked 1-year shoots of *P. serotina* proved satisfactory for unbleached sulphate pulp.

33.32 : 12.26–8. MCGOVERN, J. N., and KELLER, E. L. **Sulfite pulps from several southern hardwoods.** *Sth. Pulp Paper J.* 5 (11), 1943 (7–10).

Sulphite pulps having bleach requirements of approximately 12 per cent. standard bleach powder and an average alpha-cellulose content of 82·5 per cent. were prepared by conventional pulping procedures from Southern Cottonwood (*Populus deltoides virginiana*), Black Willow (*Salix nigra*), and Sugarberry (*Celtis laevigata*). The pulp yield from the Cottonwood and Willow was 52 per cent., whereas that from the Sugarberry was 42 per cent. The strength properties of the Cottonwood and Sugarberry pulps were somewhat superior to those of the Willow pulp.

Comparison of these pulps with Birch (*Betula papyrifera*) and Aspen (*Populus tremuloides*) sulfite pulps prepared for purifying to rayon pulps showed the former to have the same alpha-cellulose content, lower pentosans content, and amounts of ether-soluble material lower than the latter. Cottonwood and Willow gave the same yield of pulp as Aspen but a higher yield than Birch. The Birch pulp showed higher values for strength properties than did the other pulps.

Sugarberry sulphite pulps covering the range from a semichemical pulp produced in 4·2 hours to a low bleaching pulp produced in 9·5 hours showed consistent relations between pulping time and yields and properties of the pulps. An increase in pulping time caused decreases in pulp yield and lignin and pentosan contents and increases in the total and alpha-cellulose content of the pulps and their bursting and tearing strength and solid fractions. The largest part of the changes occurred when the time was increased from 4·2 to 6·5 hours. *From authors' summary.*

[See also *Mimeo* No. *R*1409, 1942. Forest Products Laboratory, Madison, Wis.]

33.32 (66.9) : 12.26–8 : 12.29. Oliphant, J. N. **Paper and cellulose possibilities in West Africa.** *Farm and Forest* 4, 1943 (39–41).

Among the plants considered as possible sources of raw materials for the local production of cellulose products in West Africa are the Umbrella Tree (*Musanga smithii*), a Bamboo probably of the genus *Dendrocalamus*, and three grasses—*Pennisetum purpureum*, *Andropogon gayanus* and *Vossia cuspidata*.

33.32 : 12.26–8. Schafer, E. R., and Pew, J. C. **Grinding and newsprint paper experiments on southern Sugarberry, Ash, Cottonwood, Willow, and Elm.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1410, 1942. pp. 4 + tbls.

Groundwood pulps of short fibre length and low tearing strength but of moderate bursting and tensile strengths were produced from Sugarberry (*Celtis laevigata*), Ash (*Fraxinus pennsylvanica lanceolata*), and Elm (*Ulmus americana*) pulpwood when ground under conditions resulting in about normal unit energy consumption. Ground under similar conditions, Cottonwood (*Populus deltoides virginiana*) and Willow (*Salix nigra*) approached average commercial newsprint groundwood in strength and fibre length, failing to meet the standard principally in the 24-mesh screen fraction and in the tearing strength.

The Willow and Elm pulps were dark in colour but the others were satisfactory in this respect. Newsprint paper having good colour and strength comparable to commercial newsprint was obtained from furnishes consisting of approximately 40 per cent. Cottonwood, Green Ash, or Sugarberry groundwood, 40 per cent. Southern Pine groundwood and 20 per cent. of semi-bleached Pine sulphate pulp. Of the three hardwood species, Cottonwood appeared first, Green Ash second, and Sugarberry third in relative suitability for groundwood pulp to be used in newsprint paper. *From authors' summary.*

33.32 : 12.26–8. Schafer, E. R., and Pew, J. C. **The grinding of Paper Birch and use of the pulp in newsprint and toweling papers.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1411, 1942. pp. 6 + tbls.

Paper Birch (*Betula papyrifera*) ground under various conditions produced short-fibred, free pulps with low strength. The use of green wood and high pit temperatures did not improve results. The pulps had a somewhat orange colour which could be reduced in intensity by washing the pulp immediately after its removal from the grinder pit. The study shows that groundwood made from this species can be used in towelling and newsprint papers up to 25 and 30 per cent., respectively. This groundwood can be produced with comparatively low energy consumption per ton.

33.32 : 12.29. Tutiya, M., and Imai, M. **Researches on Bamboo in Taiwan as a raw material for pulp. Part IV. On the ashes and some characters of pulps and 'α-celluloses' obtained by different digesting methods.** *J. agric. chem. Soc. Japan* 16, 1940 (126–9, 755–60). [Jap.e.] [Industrial Research Institute of Taiwan.] L.S.

33.34. Dyeing and Bleaching of Wood

33.34. Goodman, H. G. (to Carbide and Carbon Chemicals Corp.). **Wood-stain compositions.** *U.S. Patent* No. 2,302,760, Nov. 24, 1942. Chem. Abstr. 37 (2600). P.R.

A wood-staining dye is dispersed in a solvent vehicle including a polyhydroxy alcohol such as ethylene glycol and a condensation product of an organic amine in which the amino N atom has at least one H atom attached to it, such as monoethanolamine, with an amide of a β-keto lower monocarboxylic acid, such as acetoacetanilide, the amino N of the amine being attached in the condensation product to the β-carbon-atom of the acyl radical of the amide. Such staining compositions may be stored for some time without deterioration.

33.36. Preservation of Wood. Seasoning and Drying

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1. Wolman, K. (vested in the Alien Property Custodian). **Impregnating logs.** *U.S. Patent* No. 2,297,273, Sept. 29, 1942. Chem. Abstr. 37 (1576). P.R.

A method is employed for the impregnation of logs of any length by the sap-displacement process. A ring of bark is removed at the middle of the log and the exposed portion is then incised to a depth only sufficient to remove the entire cambium. Impregnating liquor is introduced at the butt and top ends of the log and at the same time the sap is withdrawn at the exposed ring.

33.36.1. Kramer, O. **The impregnation of vineyard stakes.** *Weinland* 12, 1940 (41–2, 55–7, 83–6). [G.] *Chem. Zbl.* 1, 1941 (2197). Chem. Abstr. 37 (2907). P.R.

The actions of $CuSO_4$ and $HgCl_2$ as preservatives for wood are discussed. Various methods of impregnation were tested and are recorded.

33.36.1. Örnhjelm, R. **The production of a domestic product for protection against blue-staining of wood.** *Finn. Paper Timb. J.* 22, 1940 (459–63). *Chem. Zbl.* 1, 1941 (2197). Chem. Abstr. 37 (2907). P.R.

The manufacture of pentachlorophenol as Ky5 by the firm of Kymmene A.-B. is described. The product is shown to be the same as the American products, Dowicide and Sanobrite.

33.36.1 : 12.25. SCHULZE, B., and THEDEN, G. Beobachtungen über das Eindringvermögen von Holzschutzmitteln beim Spritzen und Tauchen. **[Observations on the power of penetration of wood preservatives applied by spraying and dipping.]** *Holz* 6, 1943 (17–8). [G.] [Staatliches Materialprüfungsamt Berlin-Dahlem und Vierjahresplaninstitut für Werkstofforschung.] P.R.

An investigation was made of the amount and depth of penetration of a water-soluble and an oil-type preservative into specimens of Pine sapwood, the preservatives being applied at right angles to the direction of the fibres. With the oil-type preservative immersion for 5 seconds gave results slightly superior to those obtained by spraying, while with the water-soluble preservative the two methods of application gave approximately the same results.

33.36.1 : 12.25. CHAPMAN, G. W. **Brief notes on the preservation of timber with creosote by the hot and cold tank process.** *Tech. Pamphl. For. Dep. Cyprus* No. 5, 1940. pp. 4.

A brief description of the preservation treatment of Cyprus Pine (*Pinus halepensis*) with data on absorption obtained and cost of treatment using a creosote and Diesel oil mixture (40 and 60 per cent.).

33.36.1 : 12.26–8. BROWNE, F. L. **Painting hardwoods in farm buildings.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1291, 1942. pp. 3.

Woods are classified into five groups on the basis of their suitability for exterior painting. Groups I and II include the choice woods in this respect and consist entirely of softwoods. The best hardwoods for the purpose are in Group III and include diffuse porous hardwoods with small pores and moderate density (Aspen, Basswood, Cottonwood, Magnolia and Yellow Poplar). These can be painted with ordinary house and barn paints and should hold the paint well for about 4 years. They also wear well when exposed to the weather without paint. Group IV includes diffuse-porous and ring-porous hardwoods with pores no larger than those in Birch, and with a high density (Beech, Birch, Black Gum, Maple, Sweet Gum, Water Tupelo). These hardwoods can be painted with house paints but the period of durability is about 3 years or less and repainting is difficult unless all old paint is first removed. Good enamels are durable and readily repaintable on these woods. Group V includes hardwoods with pores larger than those in Birch, usually ring-porous (exception Walnut) and usually of high density (exception Chestnut)—(Ash, Chestnut, Elm, Hickory, Oak, Walnut). The pores of these woods should be filled with a paste wood filling before painting or enamelling is undertaken—an operation that is not practicable for house or barn painting. Where hardwoods of Groups III and IV are used in the outside of buildings it is suggested that consideration should be given to alternative decorative procedures (e.g. natural weathering, shingle stain) to avoid use of paint.

33.36.1 : 12.26–8 : 33.52. NARAYANAMURTI, D. **A note on the treatment of green Hollong (*Dipterocarpus macrocarpus*) sleepers.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 114, 1942. pp. 12. [Forest Research Institute, Dehra Dun.]

Experiments have shown that sleepers of green Hollong (*D. macrocarpus*) can be satisfactorily treated with a mixture of creosote and fuel oil provided that the sleepers are first conditioned by the steaming and vacuum process, or the Boulton process, or by a combination of both, the preservative then being applied by the full-cell process. On the average, about 30 per cent. moisture was lost during the conditioning and treatment. Best penetrations were obtained with those sleepers that were conditioned by a combination of the processes.

33.36.1 : 31.43 : 12.26–8 : 13.2. QUEENSLAND. **Annual report of the Department of Agriculture and Stock for the year 1941–42.** Govt. Printer, Brisbane. 1942. pp. 27. I.I.E.

Effective protection of logs against insect infestation while in storage was obtained by spraying the logs with creosote and greasing the ends. The total cost of treatment was 1*s.* 6*d.* per 100 super. ft. At the end of five months there was little or no sign of powder-post-beetle infestation.

High ringing promises to be an effective method of eliminating powder-post-beetle infestation in timber of Red Tulip Oak (*Tarrietia peralata*) (p. 7). [Cf. *For. Abstr.* 4 (234).]

33.36.1 : 33.31. **Wood preservatives.** Forest Products Laboratory, Madison, Wis. *Mimeo.* No. *R*149, (revised ed.) 1942. pp. 12.

The desirable properties of a wood preservative are noted and information is given in brief on the use and effectiveness of a number of preservatives and groups of preservatives. These are coal-tar creosote, for which the U.S. Government specification is given, crystal-free coal-tar creosote, carbolineums, water-gas-tar creosote, wood-tar creosote, tar, creosote-coal-tar solutions, petroleum oils, creosote-petroleum solutions, zinc chloride, chromated zinc chloride, sodium fluoride, arsenic, copper sulphate, mercuric chloride, clean non-swelling millwork preservatives including pentachlorphenol, tetrachlorphenol, etc., proprietary preservatives, paints and varnishes, and water repellents and 'waterproofers'.

33.36.1 : 33.31. EKSTRAND, H. **Fluorine poisoning in the greenhouse.** *Satens Växtskyddsanst. Växtskyddsnot.* 1941 (77–80). *Chem. Zbl.* 1, 1942 (695). Chem. Abstr. 37 (2537). P.R.

Experiments were carried out with wood impregnated with $ZnSiF_6$ (I) to determine its toxic action on various plants. Either the roots of the plant absorb I leached out of the wood, or I decomposes to form volatile F derivatives, which attack the green portions of the plant. The results indicate that it is inadvisable to use wood impregnated with F derivatives in hotbeds and greenhouses.

33.36.1 : 33.31. SCHAMBERGER, F. (to I. G. Farbenindustrie A.-G.). **Priming wood for painting.** *German Patent* No. 718,611, Feb. 19, 1942 (Cl. 75*c*. 5.02). Chem. Abstr. 37 (1883). P.R.

Before applying water-paint the wood surface is treated first with organic solutions, which do not render the wood water-repellent, e.g. alcohols, ketones, esters, ethers or aldehydes. After it dries, the wood is then treated with an aqueous solution of Cr_2O_3 or $(NH_4)_2CrO_4$.

33.36.1 : 33.51 : 12.25 : 33.36.3. HARDY, E. **Preserving pit props: some practical notes on the seasoning and chemical preservation of timbers for use as pit props.** *Colliery Engng.* 19 (216), 1942 (63, 65). L.S.

Creosote is one of the best preservatives of coniferous wood, particularly when it contains at least 40 per cent. naphthalene fractions. The author discusses briefly the application of creosote by the hot and cold tank process, other types of preservatives that may be used for the treatment of pit props, the value of seasoning in relation to strength qualities and preservative penetration, and the seasoning characteristics of Larch, Scots Pine and Douglas Fir. A list is given of timbers known to be naturally resistant to decay.

33.36.1 : 33.54. STARKER, T. J. **Preservative treatments of fence posts. 1942 progress report on the post farm.** *Bull. Ore. Engng. Exp. Sta.* No. 9–D, 1942. pp. 6.

Cf. *For. Abstr.* 2 (153), 4 (239). The 1942 report gives additional information on the series of posts under observation, the record of service of various species and treatments being summarized. A series of split posts of Oregon Ash (*Fraxinus oregona*) showed an average life of 96 months.

33.36.1 : 33.54. WALTERS, C. S. **Treating fence posts with pentachlorphenol-fuel oil solutions.** *J. For.* 41, 1941 (265–8).

The treatment of fence posts with a cold solution (5 per cent.) of pentachlorphenol and fuel oil appears to give good results, the method is simple, and the equipment needed is usually available to a farmer at reasonable cost. Absorption and penetration results are recorded from test treatments of posts of White Pine and a number of hardwoods. The solution is harmful to the skin and suggestions are made for protecting the hands and arms when using it.

33.36.1 : 33.6. SHIDELER, N. T. (to Steel Protection and Chemical Co.). **Preserving wood such as that of vegetable hampers for reuse.** *U.S. Patent* No. 2,299,601, Oct. 20, 1942. Chem. Abstr. 37 (1844). P.R.

A vegetable hamper designed for re-use and having sides and bottom of wood has creosote oil absorbed in the bottom and at least the lower end positions of the sides, and a coal-tar pitch coating over the bottom and side portions which are treated with the creosote oil.

33.36.1–2 : 33.31. GUNN, G. **Composition for the preservation and fireproofing of wood, timber and other materials.** *British Patent* No. 546,256, July 3, 1942. Chem. Abstr. 37 (3244). P.R.

The composition consists of a dichromate, $CuSO_4$, $ZnCl_2$ and boric acid in aqueous solution.

33.36.2. *Fireproofing*

33.36.2. **Fire-retarding coatings.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1280 (revised ed.), 1942. pp. 8.

Information is given on the effectiveness and properties of known fire-retarding preparations. These include borax-linseed oil fire-retarding paints, water solutions of fire-retarding chemicals (sodium silicate, ammonium phosphate, etc.), alginate preparations (fire-retarding chemical in aqueous sodium or ammonium alginate gel), whitewash, casein paints, synthetic-resin preparations, and loose-texture compositions.

33.36.2. MCNAUGHTON, G. C. **Fire-retardant treatments for wood.** *Wood Pres. News* 21, 1943 (32–6). [Forest Products Laboratory, Madison, Wis.] P.R.

There are two general methods available for reducing the flaming characteristics of wood by the use of fire-retarding chemicals:—(1) impregnation treatment which deposits water-borne chemicals in the wood; (2) application of suitable coatings to wood surfaces. The two methods are compared with reference to six properties and conclusions are summarized as follows:—

Property	*Coatings*	*Impregnation treatments*
1. Effectiveness.	Moderately effective.	More effective and dependable than coatings.
2. Suitability for application.	To structures already erected.	To building lumber or timbers before erection.
3. Cost.	Ordinarily less than impregnations.	Relatively high.
4. Adverse effect on strength of wood.	Probably none.	Possible in some cases.
5. Conservation of critical materials.	Small amounts used.	Substantial absorptions required.
6. Durability.	Not permanent, but renewable.	More lasting than coatings, but not renewable.

33.36.3. *Seasoning. Drying*

33.36.3. **Interim notes on chemical seasoning of timber.** Timber Development Association Ltd., 75, Cannon St., London, E.C.4. 1943. pp. 15.

Notes based on American literature. Tentative schedules for the urea-seasoning of timber are included.

33.36.3. **Kiln-drying in war time: quantity or quality.** *Leafl. For. Prod. Res. Lab.* No. 28, 1943. pp. [4]. [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Poor results from early efforts in the kiln drying of timber (particularly during the last war) were due largely to a lack of knowledge of the correct method of operation and to the tendency to dry too rapidly. It is emphasized that the operator or supervisor of the kiln must have knowledge of the proper technique of kiln drying before the best results can be obtained. Greatly accelerated drying schedules may result in the timber not being sufficiently dry or may cause defects such as splitting, honeycombing, irregular moisture distribution and casehardening.

33.36.3. KVALNES, H. M. (to E. I. du Pont de Nemours & Co.). **Seasoning moisture-containing wood such as green Oak, etc.** *U.S. Patent* No. 2,302,611, Nov. 17, 1942. Chem. Abstr. 37 (2538). P.R.

The outer surface of the wood is brought into contact with a saturated mono-NH_4 phosphate solution with the wood at a temperature at least 5 degrees below that of the saturated solution, to reduce checking and cracking.

33.36.3. BERLINER, J. F. T., and KVALNES, H. M. (to E. I. du Pont de Nemours & Co.). **Seasoning moisture-containing wood such as green Oak, etc.** *U.S. Patent* No. 2,302,594, Nov. 17, 1942. Chem. Abstr. 37 (2538). P.R.

The outer surface of the wood is brought into contact with a saturated urea solution, the wood being at a temperature at least 5 degrees below that of the saturated urea solution (such a temperature differential

serving to facilitate the urea deposition and absorption effect).

33.36.3 (54) : 07.7. REHMAN, M. A. **Types of timber seasoning kilns suitable for drying Indian woods.** *Indian For. Leafl.* (*Utilisation*) No. 34, 1943. pp. 7 + plate. [*Indian For. Leafl.* No. 11 revised.] [Forest Research Institute, Dehra Dun.]

Brief descriptions are given of the various types of timber-seasoning kilns that have been designed or tested by the Forest Research Institute, Dehra Dun, and found suitable for drying Indian woods. The general principles of the steam-heated internal-fan kiln, four types of furnace kilns and veneer driers are discussed. The approximate initial cost of installation, the cost of seasoning, and the yield of seasoned material from different types of kilns are also given in most cases.

The results of tests show that a steam-heated internal-fan kiln is suitable for the seasoning of almost all kinds of woods, including veneers. The direct-heated forced-circulation furnace kiln is suitable for drying furniture woods, and the indirect-heated internal-fan furnace kiln is suitable for drying packing-case timbers and veneers only. The indirect-heated thermal circulation furnace kiln, which is the cheapest type of kiln, is suitable for the slow seasoning of furniture woods.

A hot-air kiln suitable for completing the drying of partially air-seasoned half-wroughts used in the manufacture of articles such as shuttles, bobbins, tool handles and helves, and different kinds of kilns suitable for the seasoning of veneers, are also described briefly. *From author's summary.*

33.36.3 : 12.25. **The salt seasoning of large dimension Douglas Fir.** *Aust. Timb. J.* 9, 1943–44 (15). [Division of Forest Products, Australia.]

A note on the procedure of spreading dry salt on sawn timber to reduce surface checking during air seasoning.

33.36.3 : 12.26–8. LINDBLAD, E., and LUNDBERG, H. A. **The discoloration of Oak wood on drying with steam.** *Iva* 1941 (84–92). *Chem. Zbl.* 1, 1942 (695). Chem. Abstr. 37 (2536). P.R.

In the study of the causes of the darkening of Oak wood when steam-dried, experiments were carried out (*a*) at various temperatures, (*b*) with a preliminary period of relatively high heat, (*c*) with an interruption in the drying period, and (*d*) with the introduction of a lower atmospheric temperature in the middle of the drying period. It appears that drying should be regulated with reference rather to the moisture present in the surface layer or in a zone near the surface of the wood than to the average moisture content of the sample. These findings indicated that changes in the drying schedules might be necessary.

33.37. Distillation. Manufacture of Tar

33.37. LYAMIN, V. A. **The effect of reducing the size of the wood blocks on the yields of various products of gasification.** *Lesokhim. Prom.* 3 (8), 1940 (34–8). *Chem. Zbl.* 1, 1941 (1908). Chem. Abstr. 37 (2161). P.R.

Practical observations on the gasification of wood shavings and wood blocks revealed that lower yields of volatile substances were obtained from the blocks even though the period of gasification was 55 times as long. Special experiments carried out in laboratory retorts substantiated this observation. As the size of the pieces of wood was reduced, the yield of tar, more than that of any other product, was increased. The rate of tar formation was found to depend upon the way in which the wood blocks were cut and was increased 3 times as much by an increase in the surface perpendicular to the grain of the wood as by an equal increase in the lateral surface (parallel to the grain). The rate of acid formation was almost the same in both cases.

33.37. OTHMER, D. F., and KATZEN, R. **Tar elimination in pyroligneous acid: removal of tar-forming constituents by polymerization and condensation.** *Industr. Engng. Chem.* (*Industr. Ed.*) 35, 1943 (288–96). [Polytechnic Institute, Brooklyn, N.Y.] L.S.

A simple method is described in which pyroligneous liquors are treated with sulphuric acid for several hours with the result that practically all tar-forming constituents are easily removed as fluid tar oils.

33.37. RAZOUS, P. **Plants for carbonizing and distilling wood.** *Génie civ.* No. 118, 1941 (1–7). *Chem. Zbl.* 1, 1942 (699). Chem. Abstr. 37 (2542). P.R.

Descriptions are given of the most important wood-distillation processes, with details of the separation of AcOH from the crude pyroligneous acid. The extraction processes of Suida and the Usines de Melle, as well as the azeotropic distillation process of the Soc. des Prod. Chim. de Clamecy and of the Etabl. Lambiotte in Premery are described.

33.37. SUMAROKOV, V. P., and KLINSKIKH, E. V. **The removal of tar from aqueous distillates from the dry distillation of hardwood by the use of organic solvents. II.** *Lesokhim. Prom.* 3 (8), 1940 (3–9). *Chem. Zbl.* 1, 1941 (1881). Chem. Abstr. 37 (2162). P.R.

33.37 : 12.26–8. KATZEN, R., MULLER, R. E., and OTHMER, D. F. **Destructive distillation of lignocellulose.** *Industr. Engng. Chem.* (*Industr. Ed.*) 35, 1943 (302–5). [Polytechnic Institute, Brooklyn, N.Y.] L.S.

Various lignocellulose compounds, pure cotton cellulose, soluble lignin, and Maple wood were destructively distilled in a retort. From the data obtained the following conclusions were drawn:—Acetic acid is derived principally from the cellulose while methanol is obtained solely from the lignin. Hemicellulose in wood is the chief source of acetic acid. Soluble lignin forms larger yields of charcoal and non-condensable gases and a lower yield of total aqueous distillate than does cotton cellulose. The various lignocellulose compounds give larger yields of tar than either cotton cellulose or soluble lignin.

33.37 : 12.26–8 : 31.3. MERRITT, R. W., and WHITE, A. A. **Partial pyrolysis of wood.** *Industr. Engng. Chem.* (*Industr. Ed.*) 35, 1943 (297–301). [University of Michigan, Ann Arbor, Mich.] L.S.

When Oak wood is heated in an atmosphere of steam at atmospheric pressure, partial pyrolysis begins below 180° C. At 240° C. the modified wood retains its crushing strength and shows smaller volume changes than the original wood when its moisture content is varied. At that temperature the pentosans have been almost completely decomposed, but two-thirds of the cellulose remains and the lignin shows an apparent increase. Three-quarters of the total acid and half of the furfural, but no methanol, appear in the condensate. At 260° C. the pyrolyzed wood has a decidedly lower crushing strength and begins to show charring. The cellulose has been almost completely destroyed and the lignin cannot be determined because of the presence of charcoal. Only

one-third of the methanol has been evolved at 260° C., most of it being evolved above 280° C. The products at 400° C. show substantially the same methanol as in commercial practice and 25 per cent. more acids, the main increase being in formic and propionic acids.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38. Siegfried, H. **Wood charcoal analyses.** *Schweiz. Brau.-Rdsch.* 52, 1941 (67–8). [G.] Chem. Abstr. 37 (2913). P.R.

Twenty-four samples of wood charcoal were analyzed for moisture, ash and pure carbon. On the basis of two of the tests a relationship between pure carbon content and heating value was determined, and from this relationship the heating values of the remaining samples were calculated. Analytical values showed considerable variation.

33.38.1. Goss, W. C., and Goss, O. P. M. (to William A. Carlisle, Sr.). **Preparing primary charred wood suitable for use in gas masks after activation.** *U.S. Patent* No. 2,304,351, Dec. 8, 1942. Chem. Abstr. 37 (2916). P.R.

A carbon body such as charred briquet of comminuted Douglas Fir is heated to a calcining temperature (suitably 2100° F.) and then allowed to cool slowly (suitably during 15 hours).

33.38.1 : 12.26–8. Razous, P. **Manufacture of wood charcoal in mounds and portable kilns.** *Génie civ.* 117, 1941 (105–11). Chem. Abstr. 37 (1848). P.R.

On carbonization, deciduous wood yields 25–30 per cent. charcoal, 18–25 per cent. gas, 4–6 per cent. tar (coniferous wood up to 12 per cent. of tar) and 5–6 per cent. AcOH. White Beech yields 83 kg. and debarked Oak 103·5 kg. of charcoal per cu.m. of wood. The construction and manipulation of simple mounds and those designed for tar recovery, and of a number of portable kilns, e.g. Malbay, provided with by-product recovery plant, are described.

33.38.1 : 12.14.5. **Synthetic fuel.** *Sci. & Cult.* 8, 1942 (126). L.S.

A method is being developed in France for the manufacture of a synthetic fuel (Carbofeuille) from tree leaves. About 1 cwt. of fuel may be obtained from the leaves of an average tree. Manufacture on a commercial basis has not yet been attempted. The leaves are collected and carbonized. In the process they give rise to a gas, pyroligneous acid, and a tar. The gas, after mixing with coal gas, is used in carbonizing other leaves. The carbon thus formed is finely crushed, water and coal tar are added, and the mass is pressed into the shape of nuts and left to dry for a few days, when it is ready for use as fuel. The heat of combustion of this synthetic fuel is about 4,800 calories, and the consumption of coal tar and coal gas is very small.

33.38.1 : 34.6 : 12.25. Basore, C. A., and Moore, O. C. **The production of lump charcoal from Pine sawdust without a binder.** *Bull. Ala. Engng. Exp. Sta.* No. 14, 1942. pp. 33.

In the process described, sawdust is dried and partly carbonized under such conditions that the cohesive forces of the charcoal become effective, a pressure of several hundred lb. per sq. in. being applied to the hot charcoal in the final stages of carbonization. The briquettes are then treated for smoke removal. The resulting product is firm and strong enough to stand rough handling and to resist weathering to an extent which should permit transport and storage. The briquettes are smokeless and of satisfactory heating value. Optimum conditions for the various steps of the process have been determined on an experimental scale and a study made of costs of plant and operation for a plant with an annual capacity of 2,000 tons. The process seems to be suitable for small-scale installations and could be adapted for the utilization of waste from small mills.

33.38.1 : 34.6 : 12.26–8. **Charcoal from Eucalyptus waste.** *B.C. Lumberm.* 27 (6), 1943 (66).

By the 'Eucol' process, 4 tons of wood waste mixed with brown coal and superheated steam will produce 32–40 cwt. of charcoal of high calorific value and containing only 1 per cent. of ash. By-products of the process include branding oil, sheep dips, disinfectants, waxes and dyes.

33.38.2. Karamchandani, J. V. **Charcoal for producer gas plants.** *Indian For.* 69, 1943 (137–52).

The data contained in this article were obtained largely from distributors and owners of producer-gas vehicles in Poona. Information is given on the type and quality of wood charcoal in common use in such vehicles, and on the performance of charcoal-driven units in road and service tests. Tables showing the chemical analysis of some charcoal-producing woods (*Terminalia paniculata, T. tomentosa, Xylia xylocarpa, Casuarina equisetifolia, Chloroxylon swietenia, Anogeissus latifolia, Albizzia amara, Tamarindus indica,* and mixed hardwoods) are followed by reports of performance in actual practice. The Ford Company states that *Terminalia tomentosa* and *Anogeissus latifolia* are not suitable for use in their unit (although giving satisfactory service in other units) owing to the large quantities of lime deposited over the furnace. *Xylia xylocarpa* was reported to be more satisfactory, while specially hand-picked *Acacia arabica* charcoal was said definitely to give good service. Other users of *Acacia arabica* concur in this view. Marsland Price and Company, for example, state that a 52-mile run in wet weather was completed at an average speed of nearly 19 m.p.h., using the above fuel. This test included a 4-mile stretch of hill. Cruising at 40 m.p.h. presented no difficulties on suitable roads, pick-up was quick, and acceleration was good.

In order of frequency, the chief complaints about charcoal for producer-gas plants were:—(1) high moisture content, (2) excessive tar content, (3) high ash content, and (4) not enough pulling power. In answer to these objections the writer points out that the high moisture content can be remedied by drying the charcoal before use; that the tar content can be reduced, if not eliminated, by improved carbonization; that the ash content can be reduced by using smaller billets; and that poor pulling power may be due to a worn-out, inefficient engine, to inexpert handling of the vehicle, or to lack of proper maintenance.

Detailed data are given on service performance of producer-gas vehicles using wood charcoal, as reported by various large-scale users of such plant.

33.38.2 (485). Hummelgren, E. **Three years of Swedish producer gas traction.** *Anglo-Swedish Rev.* 1943 (57). Fuel Res. Summ. 1943 (237). P.R.

In Sweden at the present time 73,000 lorries, passenger cars and buses are being operated on gas generated from charcoal or uncharred wood, and about 10,000 tractors have been converted for burning the same fuel.

Producer gas is also being used on an increasing scale for smaller craft and for stationary engines.

33.38.2 (489). ARNBAK, L., and DAMGAARD, J. **Wood charcoal and peat coke. Preparation in Jutland of carbon for gas producers.** *Kem. Maanedsblad. nord. Handelsbl. kem. Ind.* 22, 1941 (144–8). *Chem. Zbl.* 1, 1942 (1578). Chem. Abstr. 37 (3248–9). P.R.

The preparation of charcoal and peat coke in Jutland is described. It is done partly in earth mounds and partly in so-called French steel mounds. For use in gas producers on motor vehicles charcoal produced by the latter method is preferred as contamination with sand is thereby avoided.

33.38.2 : 12.26–8 (54). RAMASWAMI, S., DEY, A. C., and VARMA, B. S. **Charcoal for producer-gas plant.** *Indian For. Leafl.* (*Chemistry and minor forest products*) No. 35, 1943. pp. 6. [Forest Research Institute, Dehra Dun.]

Specifications for what may constitute a good quality charcoal for producer-gas plant are given together with a list of the woods that have been found to yield charcoal suitable for producer gas and that are likely to be used for this purpose in India.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. BERGIUS, F., and KOCH, F. **Saccharifying ground wood or similar vegetable matter.** *German Patent* No. 709,758, July 17, 1941 (Cl. 89*i*.1.02). Chem. Abstr. 37 (3605). P.R.

The treated material proceeds through a tubular apparatus counter-current to an acid. The acid-sugar solution free of lignite is drained at one end and the ligneous residue is discharged at the other end.

33.39. GIORDANI, M., and LEONE, P. (vested in the Alien Property Custodian). **Saccharification of cellulose.** *U.S. Patent* No. 2,302,022, Nov. 17, 1942. Chem. Abstr. 37 (2180). P.R.

A process is employed for the saccharification of cellulose, either free or contained in wood and vegetable materials, by the use of first diluted, and afterwards concentrated H_2SO_4, which involves subjecting the cellulosic material to a preliminary treatment for about 30 minutes in an autoclave in a dilute solution of H_2SO_4 containing 0·05–5 per cent. of H_2SO_4 at a temperature from 135° to 150°, to transform cellulose into hydrocellulose, subsequently treating the residual mass consisting of hydrocellulose and lignin obtained from this preliminary operation, with cold concentrated H_2SO_4 having a concentration of at least 70 per cent., suitably cooling the resulting mass for the purpose of preventing the rise of temperature due to the exothermic nature of the reaction, and finally diluting the mass with water and heating it to 100°.

33.39. KOCH, F., and KOCH, H. (to Holzhydrolyse Akt.-Ges.). **Saccharification of wood.** *German Patent* No. 707,573, May 21, 1941 (Cl. 89*i*.1.02). Chem. Abstr. 37 (2934). P.R.

Ground wood is treated in a diffuser with aqueous HCl. The acid flows in a continuous circuit through the wood. At one point part of the acid is tapped and returned to the head of the circuit.

33.39. ZEIDLER, R. **Saccharification or hydrogenation.** *Tek. Fören. Finland Förh.* 62 (8), 1942 (153–8). *Svensk PappTidn.* 45, 1942 (410). *Bull. Inst. Paper Chem.* 13, 1943 (265–6). P.O.

An estimate of the results which can be obtained by hydrogenation of peat or wood by the I.G. Farbenindustrie A. G. method indicates that wood hydrogenation yields benzine, the manufacturing cost of which amounts to only 72 per cent. of the cost for the equivalent quantity of alcohol obtained by wood saccharification. However, peat is more suitable for hydrogenation and the cost is only 56 per cent. of that for the production of an equivalent quantity of alcohol by wood saccharification.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

33.53 : 12.25 : 33.36.1. CLARK, O. S. **Wood-pole 230-kv transmission lines.** *Wood Pres. News* 21, 1943 (63–6). P.R.

This article discusses briefly the design and construction of a single-circuit, wood-pole 230-kv transmission line. The poles used were of Douglas Fir and Southern Pine, pressure treated with 8 lb. of creosote per cu. ft., and butt-treated Western Red Cedar.

33.6. *Packing Boxes, Crates, etc.*

33.6. LIMAYE, V. D. **The testing of packing-cases and some suggested improvements in the design of such boxes.** *Indian For. Bull.* (*n.s.*) *Utilisation* No. 117, 1943. pp. 11. [Forest Research Institute, Dehra Dun.]

33.7. *Firewood* (*Converted*)

33.7 : 07.7. SCHLÄPFER, P., and STADLER, O. **The burning of wood in central heating plants.** *Bull. tech. Suisse rom.* 66, 1940 (154–8, 161–5, 177–84). [F.] *Chem. Zbl.* 1, 1942 (2218). Chem. Abstr. 37 (3249). P.R.

The theory of the burning of wood is discussed. The variation of heating value with the water content and with the elementary composition for various types of wood is given. The dewpoint and CO_2 content of the waste gas are compared with those of waste gas from coke. Central heating plants for coke are suitable for wood. The appropriate arrangements for burning wood with simultaneous utilization of the waste gas for heating or cooking are described.

33.7 : 31.24. **Wood fuel and wood stoves.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1279, 1942. pp. 6.

Wood to be used as fuel should be as dry as possible in order to produce more heat per pound of fuel, to obtain higher efficiency, and to lessen creosote trouble. To obtain complete combustion of wood requires a relatively large supply of air, most of which should be over and around the fuel. To prevent undue creosote trouble dry wood should be burnt in a small hot fire, the stove being refuelled fairly often. Short stove pipes and insulated pipes are advantageous in this connexion.

Notes are included on hogged-fuel burners, wood briquettes, burning wood with coal, European slow-combustion stoves, American wood-burning stoves, and research in wood fuel.

A table gives the approximate weights and heating values per cord of wood (green wood and wood with 20 per cent. moisture), and the equivalent to tons of coal in heat value of a number of American species.

33.8. *Other Manufactured Products*

33.8 : 31.2 : 33.36 : 31.43. Benson, A. O., and Bell, C. C. **Guide to use of wood as an alternate material in agricultural implements.** Forest Products Laboratory, Madison, Wis. *Mimeo* No. *R*1298, 1942. pp. 14 + tbls.

Serviceable woods are listed for different types of farm equipment and some of the commercially important woods are broadly classified according to characteristics and properties. Brief notes are included on availability of species, optional forms of wood stock and sources of supply, lumber grading, seasoning, preservative treatment, bent-wood equipment, and wood-damaging insects.

33.9. *Grading and Storage of Converted Timber*

33.92 : 33.36.3. Tiemann, H. T. **The storage of kiln-dried lumber.** *Sth. Lumberm.* 166 (2085), 1943 (59–61).

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.21. Fodder Grass and Grazing

34.21 (75.8) : 97.3 : 43.11. Biswell, H. H., Southwell, B. L., Stevenson, J. W., and Shepherd, W. O. **Forest grazing and beef cattle production in the coastal plain of Georgia: Results of a survey of 106 cattle producing farms.** *Circ. Ga. Cst. Plain Exp. St.* No. 8, 1942. pp. 25.

About two-thirds of the Georgia Coastal Plain region is under some form of forest; the three important forest types in the region are (1) the Loblolly Pine/hardwood, mainly in the upper Coastal Plain, (2) the Longleaf/Slash Pine in the middle Coastal Plain, and (3) the Longleaf/Slash Pine/Cypress type, mainly in the lower division. It is shown that, for the area surveyed, forest-land grazing makes up about 65 per cent. of the year-long feed of beef cattle. Some cattle grazing on suitable forest areas appears to be helpful in reducing the fire hazard, besides increasing the farmers' annual income from his forest land.

About 40 per cent. of the farmers using forest range are practising controlled burning in order (*a*) to insure against devastating fires, (*b*) to improve the forage for grazing, and (*c*) to check brush invasion. An attempt is made to protect areas of poor tree regeneration for a period long enough to establish a stand, perhaps 8 to 10 years. Afterwards a controlled burning of the forest is made every two or three years under conditions that will cause least damage to the trees. This practice appears to give favourable results. [Cf. *For. Abstr.* 4 (182).]

34.23. Wood Ash. Potash

34.23 : 12.26–8. Šťastný, J., and Medal, C. K. **Analysis of the ash of several woods.** *Sborn. čes. Akad. Zemědělské* 16, 1941 (483–90). *Chem. Zbl.* 1, 1942 (2489). Chem. Abstr. 37 (3221). P.R.

An investigation was made of the ash of aqueous and alcoholic extracts of wood. A method differing from others was used for complete analysis of carbonate ash. Ash on a moisture-free basis was as follows:—Oak 0·222–0·379 per cent., Ash 0·423–0·517 per cent., Beech 0·443–0·503 per cent.

34.24. Tanning Materials

34.24 (75). Russell, A., with Associates. **Natural tanning materials of the southeastern United States: I. A preliminary report covering the period July 1, 1940–August 1, 1941.** *J. Amer. Leather Chem. Ass.* 37, 1942 (340–56). [University of North Carolina, Chapel Hill, N.C.] L.S.

A preliminary survey of all available tanning materials in the southeastern United States. Up to the date of this report, specimens of 95 different varieties of trees had been collected, about 30 of which had been examined and tannin extracts obtained. A list is given showing the tree species collected for trial, together with notes on the quality and quantity of their tannin content, where such data are available. Indexes of common and botanical names are appended. In addition to the trees listed, several species of *Rhus* and *Acacia* are also receiving attention.

34.24 (75) : 12.26–8. Russell, A., with Associates. **Natural tanning materials of the southeastern United States. II. Domestic leaf Sumac—a practical and satisfactory substitute for Sicilian leaf.** *J. Amer. Leather Chem. Ass.* 38, 1943 (30–4). L.S.

Practical tannery tests have shown that properly prepared domestic Dwarf-Sumac leaf (*Rhus copallina* L.) is a satisfactory substitute for Sicilian leaf (*R. coriaria* L.) as a tanning material. Although all 14 species of the Sumac family (Anacardiaceae) found in the southeastern United States contain some tannin, only 3 species are of practical importance:—Dwarf-Sumac, White-Sumac (*R. glabra* L.), and Staghorn-Sumac (*R. hirta* (L.) Sudw.). These contain 26 per cent., 21 per cent., and 17 per cent. tanstuffs respectively. For tannage and colour *R. copallina* is superior to the two other species, while *R. glabra* is preferable in these respects to *R. hirta*. Fortunately, *R. copallina* is by far the commonest species in the southeast.

34.24 : 12.14.8 : 12.25. Belavsky, E., and Mazal, E. **The production of Pine-bark extract.** *Tech. Hlidka Koželužská* 17, 1941 (45–127). *Chem. Zbl.* 1, 1942 (2957). Chem. Abstr. 37 (3631–2). P.R.

A history of the production of Pine-bark extract. Methods of collecting, storing, grinding and extracting bark and evaporating liquors are reviewed. Numerous tables of data and sketches and photographs of grinding mills and extraction batteries are given. Bark is best stored in open sheds; its H_2O content should be below 25 per cent. For modern extraction batteries the best size of bark is 0·5–1·0 cm. The authors have determined that soaking must precede true extraction of the bark. Soaking is dependent on temperature, pressure and time. The same degree of soaking is reached in 6 hours at 100° as in 48 hours at 18° under normal pressure, but at 100 atm. only 0·5 hour is needed. In practice a pressure is chosen so that soaking will be complete in 2–3 hours. The use of high temperatures is indicated because the tannin is stable at 90–100°, but 70° must not be exceeded or there will be turbidity and formation of sediment; at 100° 10–20 per cent. of sludge may form. Addition of syntans during extraction prevents turbidity.

34.24 : 12.25. Stather, F., and Sagoschen, J. A. **Sulphite extraction in the preparation of Pine-bark extracts.** *Ledertech. Rdsch.* 34, 1942 (9–12). [G.] *Chem. Zbl.* 1, 1942 (2224–5). Chem. Abstr. 37 (3297). P.R.

Extraction of Pine bark by the sulphite process can increase the yield of tannin appreciably and produce an extract that is not noticeably poorer in tanning behaviour than normal Pine-bark extract. Systematic, fundamental investigations have shown that the time of introduction of sulphite is as important as the length of time of the reaction. A working method for the sulphiting is described.

34.24 : 12.26–8. CLARKE, I. D., STEINER, E. T., and FREY, R. W. **Effect of age on the size and tannin content of Chinese Chestnut trees grown in Maryland.**—With discussion. *J. Amer. Leather Chem. Ass.* 37, 1942 (591–8). [U.S.D.A. Bureau of Agricultural Chemistry and Engineering, Philadelphia, Pa.] L.S.

Five trees of *Castanea mollissima* grown from Chinese seed in an orchard at Bell, Maryland, were sampled for tannin in 1928 (when about 16 years old) and two additional trees from the same orchard were sampled nine years later. This report compares the results of these tests which show an increase of slightly more than 1 per cent. in the tannin content of the wood throughout the tree during this period. Relatively large decreases were found in non-tannins and sugars in the root wood, and in tannin, non-tannins, and sugars in the bark of roots and branches. The differences between the tannin, non-tannin and sugar contents of the various parts of the tree generally became less as the tree aged.

34.24 : 12.26–8. MUSICK, A. H. **The distribution of tannins in certain plant tissues.** *Pharm. Arch.* 13, 1942 (88–94). Chem. Abstr. 37 (3472). P.R.

Copper acetate was found to be the most satisfactory of the reagents used in tests for tannin. The dried stem and leaf of *Hamamelis virginiana* L., the dried leaf of *Castanea dentata* (Marsh) Borkh., and the fresh leaf of *Quercus alba* L. were examined for tannin, which was found to be widely distributed and may be present in any tissue of the stem or leaf.

34.24 : 12.26–8. SENNI, L. **The cultivation of tannin bearing Acacia in Italian East Africa.** *Boll. R. Staz. p. l'Ind. d. Pelli* 19 (2), 1941 (18). [Ital.] *Abstr.* in *J. Amer. Leather Chem. Ass.* 38, 1943 (44). L.S.

The following species of Acacia, of Australian origin, are of particular importance as sources of vegetable tannin:—(1) *Acacia mollissima* Willd. (Black Wattle), (2) *Acacia decurrens* Willd. (Green Wattle), (3) *Acacia pycnantha* Benth. (Golden Wattle), (4) *Acacia dealbata* Link. (Silver Wattle). The bark of the first two species contains as much as 36 per cent. of an acid tannin. A botanical description of each species is given. *A. mollissima* is considered to be the most important, and for this reason its cultivation has been attempted in many countries, including South Africa, Morocco, Portugal, and Italy. The climatic conditions necessary for the cultivation of these species are fully described; it is pointed out that many locations in Italian East Africa are favourable for large-scale cultivation of the Acacia species.

34.24 : 12.26–8 (92). SPOON, W. **Tanniferous wood of the overseas Netherlands.** *Supplement* to *Ned. Leder-Ind.* 53 (34), 1941 (1891–5). *Chem. Zbl.* 1, 1942 (1086). Chem. Abstr. 37 (2608). P.R.

Tanning experiments showed that the extracts made from the heartwood of *Cotylobium* sp., *Dryobalanops oblongifolia*, *Vatica leucocarpa*, *Castanea argentea*, *Eperua falcata*, *Intsia amboimensis* or *I. palembanica* were valuable, practical tanning agents.

34.25. Christmas Trees. Medicinal Plants. Edible Plants

34.25 (71.1) : 32.21 : 66. **Christmas tree farming and permits for cutting.** British Columbia Forest Service. [1942?] pp. 14.

In British Columbia permits for cutting Christmas trees are being issued with the object of encouraging a permanent Christmas-tree industry based on methods of sustained production on poor-quality sites. These permits are issued only for areas thought to be incapable of producing good quality Douglas-Fir timber. The methods of management and cutting practices recommended by the Forest Service are outlined briefly, and explanatory notes are given on some of the conditions to be fulfilled by permit-holders. The Department undertakes to grant the annual renewal of permits provided all conditions are complied with to the satisfaction of the forest officer in charge.

34.25 (47.2–6). SHISHKIN, B. **The work of Soviet botanists.** *Science* 97 (*n.s.*), 1943 (354–5). [Institute of Botany of the Academy of Science of the U.S.S.R.] L.S.

Contributions made by Soviet botanists to the war effort include the preparation of Fir balsam which, when mixed with other substances, is used for the treatment of fresh wounds; the production of vitamin C from green, unripe Walnuts and from Pine needles; and the preparation of a flour from dried fruits of the Rowan and Bird Cherry.

34.25 : 12.26–8 : 12.14.5 : 12.14.7. VINSON, C. G., and CROSS, F. B. **Vitamin C content of Persimmon leaves and fruits.** *Science* 96 (*n.s.*), 1942 (430–1). [University of Missouri.] L.S.

Fresh leaves of Persimmon (*Diospyros virginiana*), both wild and named varieties, show a very high content of vitamin C, the concentration of this vitamin in the leaves being about 10 times that in the fruit. A tea made from dried leaves contained about 60 per cent. of the titratable material in the original dried leaf. Two-year-old dried leaves retained about one-tenth of the original titratable material.

34.25 : 12.14.7 : 12.26–8. KING, T. R., and TITUS, H. W. **Acorns of the Willow Oak, *Quercus phellos*, a source of vitamin A activity.** *Poult. Sci.* 22 (1), 1943 (56–60). [Virginia Polytechnic Institute, Blacksburg, Virginia.] L.S.

The addition of 1 per cent. of ground acorns (kernels and shells but not the caps) of Willow Oak to a vitamin-A-deficient diet was found to be as effective as 108 micrograms of carotene (in peanut oil) per 100 gm. of feed in maintaining growth and viability of chicks.

34.25 (85). HERRERA, F. L. Plantas silvestres empleadas como alimento en el Peru. [**Forest plants used as food in Peru.**] *Bol. Mus. Hist. Nat. 'Javier Prado'* 5 (2), 1941 (169–80). [Span.] Biol. Abstr. 17 (12166).

The plants are described with notes on their use. Both scientific and common local names are given.

34.25 : 12.14.7 : 12.26–8 (42.1–8). REDGROVE, H. S. **Nuts: edible value of certain English-grown varieties.** *Food* 12, 1943 (63–4). L.S.

Some indication is given of the food value of nuts from certain English-grown trees, including *Corylus*

avellana L., *C. maxima* Mill., *Castanea sativa* Mill., *Juglans regia* L., and *Prunus amygdalus* Stokes. The fruit of *J. regia*, if picked just before the formation of the shell, is said to be very rich in ascorbic acid (vitamin C) and investigations have shown percentages of this acid to be as high as 1·46–1·80.

34.25 : 12.14.8 : 12.26–8. Small, J. **Cassia bark: a pocket-lens study.** *Food* 12, 1943 (41–3). L.S.

Cinnamomum cassia (Lauraceae), from which Cassia bark was originally obtained, has long been cultivated in China. Cassia bark is obtained from other species of *Cinnamomum*, however, including the widely distributed *C. iners* of India, Ceylon, and Malaysia, and the Malaysian *C. kulit-lawan* and *C. sintoc*. Bark of the Cassia type may be obtained from the closely allied *C. loureirii* (Saigon or American cinnamon), *C. burmanii* (Java cinnamon), *C. obtusifolium*, and *C. tamala*. The name 'Cassia' was probably derived from the district of Khasia where three species with cinnamon-flavoured bark (*C. tamala*, *C. obtusifolium* and *C. pauciflorum*) are found.

The structure of the bark, as seen under a pocket lens, is described. Some of the uses of Cassia as a flavouring agent are noted.

34.25 : 12.14.7 : 12.26–8. Small, J. **Cassia buds: a pocket-lens study.** *Food* 12, 1943 (69–71). L.S.

Cassia 'buds', used extensively as a spice, are the dried, unripe fruits of the Chinese Cassia tree, *Cinnamomum cassia*. The dried fruits of other species of *Cinnamomum*, including the more mature fruits of *C. iners* from southern India, are also used for the same purpose. The structural anatomy of the Cassia 'bud' is described and illustrated.

34.26. Resin. Gums. Turpentine. Oils. Rubber. Latex. Dyestuffs

34.26 : 12.25. Martin, R. W. (to Hercules Powder Co.). **Resin from Pine wood.** *U.S. Patent* No. 2,307,935, Jan. 12, 1943. Chem. Abstr. 37 (3590). P.R.

For producing a resin which is substantially insoluble in light petroleum hydrocarbons, Pine wood is extracted with an organic solvent such as benzene or toluene, which dissolves the normally solid resinous materials and terpene oils present in the wood, the extract is separated and butane is added to it as a precipitant, and the precipitate formed is separated and dried. U.S. 2,307,936 relates to a similar process in which propane is used instead of butane.

34.26 : 12.25 : 12.11.3 : 12.11.22. Mitchell, H. L., Schopmeyer, C. S., and Dorman, K. W. **Pedigreed Pine for naval stores production.** *Science* 96 (*n.s.*), 1942 (559–60). [Southern Forest Exp. Sta.] L.S.

Trees of *Pinus caribaea* that were found to produce exceptional yields of oleoresin were selected for study and records were kept of the weekly yield of gum of these trees and of control trees of the same species, age, size, growth rate and general appearance growing under comparable conditions on a similar site. The selected trees were found to produce from 2 to 3 times as much gum as their respective control groups.

Research in vegetative propagation was undertaken in order to speed up the production of planting stock having high gum-yield characteristics. It was found that more than 90 per cent. of the cuttings taken from young Slash-Pine trees could be rooted within five weeks from the time of planting. However, cuttings from older trees, for which gum records were available, proved more difficult to root, successful rooting being obtained only on cuttings given rather complex chemical treatments. The most favourable treatments and environments for propagating such cuttings are noted.

34.26 : 12.25. Petrov, M. F. **Rosin from the Balsam growth of Adler Park.** *Lesokhim. Prom.* 3 (8), 1940 (55–7). *Chem. Zbl.* 1, 1941 (1886). Chem. Abstr. 37 (2597). P.R.

The *Abies balsamea* from Alder Park on the shore of the Black Sea yields about 35 g. of resin per trunk (3 m. high). The following data are reported for this resin and (in parentheses) for a resin from *Abies balsamea* of the nursery of the Forest Institute of Bryansk: d. 0·9762 (0·9938), acid no. 106 (78), ether no. 12·35 (23), sapon. no. 108.35 (101), *n* 1·526 (1·527) and turpentine content 28·82 (25·5–29·5) per cent.

34.26 : 12.25. Traylor, W. N. (to Hercules Powder Co.). **Refining wood rosin.** *U.S. Patent* No. 2,306,652, Dec. 29, 1942. Chem. Abstr. 37 (3287). P.R.

Refining is effected by treatment with an acid salt such as $NaHSO_4$ and with a metal above H in the electromotive series, such as Zn, in the presence of at least a small amount of water (suitably at about 70–125°). U.S. 2,306,653 relates to refining Pine oleoresin with an acid salt such as $NaHSO_4$ and a metal above H in the electromotive series, such as Zn, in the presence of an ionizing solvent for the acid salt, such as water, and at a temperature within the approximate range of 60–150°.

34.26 : 12.26–8. Dutt, A. T., Ghosh, S., and Chopra, R. N. **Chemical investigation of the gum resin from *Balsamodendron mukul* Hook.** *Indian J. med. Res.* 30, 1942 (331–4). Chem. Abstr. 37 (2887). P.R.

34.26 : 12.25. **New chemical treatment increases gum flow of Longleaf and Slash Pine.** *Du Pont agric. News Letter* 11 (1), 1943 (3–4). Biol. Abstr. 17 (14563).

A 40-per-cent. H_2SO_4 solution applied to the fresh streak increased the average annual gum flow 25 per cent. on both Longleaf and Slash Pine. A 25-per-cent. solution of caustic soda (lye) increased yields for both species 75 per cent. on a weekly chipping schedule.

34.26 : 12.25 : 01.4. Chesnokov, F. A. **The technology of the production of vegetable gum from Larch wood.** *Lesokhim. Prom.* 3 (8), 1940 (9–16). *Chem. Zbl.* 1, 1941 (1886). Chem. Abstr. 37 (2607). P.R.

The vegetable gum from Larch wood yielded 90·1 per cent. galactan and 9·9 per cent. araban. In the extraction of this wood with water the yields increased with increasing temperature. By treating wood splinters 3 mm. long in diffusion batteries with 10 aggregates operating at a temperature of 40° with 100 per cent. (calculated on the weight of wood) removal of the extract per hour, 8 per cent. gum solutions were obtained. Still better results were obtained by working with acid solutions. In this connexion mineral acids were more effective than HOAc; however, mineral acids destroyed the wood tissue and HOAc was used in succeeding experiments. By treating wood splinters 3–4 mm. in length and having a moisture content of 11–12 per cent. in extraction batteries with 7–8 aggregates using an acid concentration of 0·2 per cent. and operating at 30° with 150 per cent. (calculated on the dry weight of wood) removal of the extract per hour it was possible to

extract 90 per cent. of the gum contained in the wood to give a 7–8 per cent. solution. The crude gum contained up to 82·9 per cent. of the arabo-galactan complex, $C_5H_8O_4$ $(C_6H_{10}O_5)_6$. The ash content was 2 per cent. and the tannide content 0·7 per cent. of the insoluble matter. The aqueous extracts were brown and the acid extracts yellow. Attempts to decolorize these extracts were unsuccessful either because the agents were not sufficiently effective (C and plant fibres) or because they were injurious (SO_2), or technically impracticable (Al and Mg oxides) or too costly (alcohol).

34.26 : 12.25. Okay, M. I. **The production and processing of turpentine from *Pinus brutia* in Turkey.** *Yüksek Ziraat Enstitüsü Calismalarindan* 106, 1940 (3–44). *Chem. Zbl.* 1, 1941 (1479). Chem. Abstr. 37 (1882). P.R.

The origin and distribution of sources of turpentine are discussed. Resinification tests and sampling in the forests of Yamanlar in Izmir showed that production of resin in Turkey is feasible. The fresh turpentine contained 33 per cent. of neutral substances and 64 per cent. resin acids. Distillation with steam yielded 28·9 per cent. turpentine oil and 71·1 per cent. colophony. Isolation of the natural resinic acid (m. 149–50°) by a method in which air is excluded is described. Studies of the constitution of the resin and comparison with that of other resins are recorded.

34.26. Guenther, E. S. **Botany, origin and application of essential oils.** *Repr.* from *Amer. Perfum.* Jan. 1943. pp. [15]. [Fritzsche Brothers, Inc., New York City.]

An alphabetically-arranged list of all the important essential oils, with notes on the plant source of each, where the plant is grown, and the uses to which the oil is put. A list showing the places of origin of essential oil-producing plants is included.

34.26 : 12.26–8 (81). Bondar, G. Penao, *Cnidoscolus marcgravii* Pohl, novo recurso oleifero da Bahia. **[Penão, *Cnidoscolus marcgravii* Pohl, a new source of oil in Bahia.]** *Bol. Inst. cent. Fomento econ., Bahia* No. 12, 1942. pp. 16. *Abstr.* in *Trop. Woods* 74, 1943 (47).

An account of a species of *Cnidoscolus*, a tree of eastern Brazil, with an illustrated discussion of its botanical characters and taxonomic identity. The wood of the Penão is in demand for refrigerator insulation; the edible seeds yield a semi-drying oil.

34.26 (51) : 12.26–8. Guenther, E. **Oil of Cassia: a survey.** *Drug & Cosmetic Ind.* 51, 1942 (532–5; 657–9, 695). [Fritzsche Brothers, Inc., New York.] L.S.

Cinnamomum cassia is an evergreen tree native to the Provinces of Kwangsi and Kwantung in southeastern China. Efforts to establish it in other countries have generally been unsuccessful. Wild trees may reach a height of 60 ft. in 30 years. When cultivated for the production of bark and oil, Cassia is grown as a coppiced bush. At 5–7 years trees 5–9 ft. high are cut back close to the ground and new shoots are allowed to develop from the stumps and roots.

The leaf oil and bark oil of this species are of identical chemical composition, the main constituent of each being cinnamic aldehyde (70–95 per cent.).

In the present paper the author, after dealing briefly with the distribution and planting of the tree and the harvesting and distilling of the leaves and twigs, discusses Cassia oil with reference to yield, quality, marketing, adulteration, production and exports, physical and chemical properties, analysis, and chemical constitution.

34.26 : 12.26–8. Rangaswami, S. **Bitter principles of the Neem [*Azadirachta indica*] oil.**—With comment. *Curr. Sci.* 11, 1942 (367–8). [Andhra University, Guntur.] L.S.

34.26 : 12.14.7 : 12.26–8. Singh, B. K., and Saran, B. **Fatty oil from seeds of *Mallotus philippinensis*, Muel. Arg. (N.O. Euphorbiaceae).** *Curr. Sci.* 11, 1942 (360). L.S.

Kernels of *M. philippinensis* contain 48·8 per cent. of oil, which has a specific gravity 0·9333, refractive index at 34° C. 1·5156, acid value 11·3, saponification value 207·6, iodine value 157·3, acetyl value 46·8, Hehner value 96·1, unsaponifiable matter 1·9 per cent.

34.26 (6). Chevalier, A. **African wild rubbers and their future.** *Rev. gén. Caoutch.* 18, 1941 (126–7). Chem. Abstr. 37 (2213). P.R.

34.26 (67.6). Thomas, A. S. **The production and preparation of rubber in Uganda.** *E. Afr. agric. J.* 8, 1943 (231–7). [Rubber Production Committee, Uganda.]

During the peak period of expansion in the rubber estates of Uganda, from 1910 to 1920, the area under the crop (chiefly *Hevea*) increased from about 1,400 to about 14,000 acres. Results, however, were disappointing. It took roughly 8 years for the trees to attain a size suitable for tapping, and average yields were low, owing possibly to the insufficiently high temperatures and unsuitable soils of Uganda, and to poor planting stock. Difficulties were increased by the practice of planting the crop in relatively small areas at considerable distances from each other. By 1942 most of the Uganda trees (planted mainly before 1920) had passed their prime and only a few hundred acres of young, untapped trees remained. However, as the exploitation of estate rubber offers a greater potential source of supply than does the wild rubber, work is again in progress on the plantations. The small area of Ceara rubber (*Manihot*), amounting to less than 100 acres, is also being exploited.

Of wild rubbers, *Funtumia elastica* is of some importance, although the latex is difficult to coagulate and its collection is troublesome owing to the uneven distribution of the species. Nevertheless, it is hoped that by drastic tapping a significant amount of rubber can be produced from this source during the next 18 months or 2 years.

Two vines, *Landolphia dawei* and *Clitandra orientalis*, also offer possibilities as rubber-producers. These, and other rubber-producing species of *Landolphia*, are discussed.

Although at present experiencing a boom, the rubber industry of Uganda is likely to be only of a temporary nature. The heavy production of the selected trees of Para rubber in the east, together with the huge synthetic rubber industry of America, render it highly improbable that the production of rubber in Uganda will be of any importance after the war.

34.26 : 12.26–8. Doten, S. B. **Rubber from Rabbit Brush (*Chrysothamnus nauseosus*).** *Bull. Nevada agric. Exp. Sta.* No. 157, 1942. pp. 22.

Estimates made by the Nevada Agricultural Experiment Station in 1925–26 indicated that the Rabbit

Brush areas of northern and central Nevada and adjacent parts of California were capable of yielding almost 40,000 tons of rubber of good quality, provided total exploitation were possible. The rubber is contained in the cells of the inner bark and the outer wood of *Chrysothamnus nauseosus*. It is inferior only to the best Brazilian rubber and to the plantation rubber of the Malay Peninsula in its qualities after vulcanization. The yield of rubber per acre, however, is very low, the rubber-bearing wood usually producing less than 2·5 per cent. of rubber, although the variety *viridulus* occasionally produces as much as 7 per cent. Moreover, as far as is known at present, there are no by-products which might help to reduce the cost of extracting the rubber. The shrub does not bear its maximum quantity of rubber until it is 6–10 years old, and the harvesting of the crop more frequently than at 5-year intervals, in the case of the best varieties, would not be possible. The cost of growing and harvesting such a crop, of hauling it to the mill, and of extracting the rubber would be very high, and only in time of national emergency would the exploitation of this source of rubber be economically practicable.

34.26 (728) : 12.26–8 : 07.2. EGLER, F. E. **The Chicle Development Company Experiment Station.** *J. For.* 41, 1943 (375–6).

The Chicle Development Company Experiment Station has been established to undertake investigations of significance to the chicle industry in Central America, including studies concerned with forest conversions to pure stands, plantations, new tapping systems, the effects of present and improved exploitation methods, and botanical sources of chicles other than *Achras zapota*. Field investigations are to begin in northern British Honduras on the 46,000-acre Honey Camp Experimental Forest.

34.26 (67). MARTIN, G. **Wild rubber of tropical Africa.** *Industr. Chem. chem. Mfr.* [18], 1942 (461–2). O.R.S.

Apart from *Hevea brasiliensis*, the most prolific producers of rubber are certain woody plants which grow wild in tropical and subtropical Africa. The best known of these is the tree, *Funtumia elastica*, which is found mainly in the dense forests of moist, hot regions in the tropics. This tree yields about ¼ lb. of dry rubber per tapping and should be tapped not more than twice a year. The principal genera of rubber vines (very widely distributed throughout tropical and subtropical Africa) are *Landolphia*, *Clitandra*, and *Carpodinus*. When tapped twice a year these yield from 1 to 4 oz. of rubber per annum. Normal acid coagulating methods cannot be used with the latex of *Funtumia* on account of its pronounced stability. The vine latices are coagulated by heat, by acids or plant juices, and sometimes by common salt. In comparison with that of *Hevea* the nitrogen content of *Funtumia* and *Clitandra* are usually high while that of *Landolphia* is low. As most wild rubbers are relatively rich in resin and show a deficiency in natural fatty acids some adjustment of standard formulae may be necessary. In unloaded compounds these wild rubbers display relatively poor mechanical properties, but in heavily loaded compounds or in mixture with standard *Hevea* rubber their behaviour may be satisfactory.

34.26 : 12.19.1 (729.6). STEHLÉ, H. Classification des arbres à latex et à sécrétions de gommes, résines et matières colorantes aux Antilles françaises. [**Classification of latex-yielding trees, and trees having secretions of gums, resins, and colouring matter, in the French Antilles.**] *Carib. For.* 4, 1943 (112–23). [F.e.sp.]

A general classification of about seventy tree species based on the exterior appearance of the secretion, the form of leaves and flowers, and the colour of the wood.

34.26 (7) : 12.26–8. TRUMBULL, H. L. **Growing rubber in North America.** *Industr. Engng. Chem.* (*Industr. Ed.*) 34, 1942 (1328–35). (B. F. Goodrich Company, Akron, Ohio.] L.S.

A review of work at present being undertaken in America in the hope of increasing the domestic resources of natural rubber. Most of the rubber-producing plants dealt with are species from which quick returns can be expected. They include two types of Goldenrod (*Solidago leavenworthii* and *S. edisonsiensis*), Kok-sagyz, Guayule, Rabbit Brush (*Chrysothamnus*), and the vine, *Cryptostegia grandiflora*.

Plantation rubbers in the Americas consist mainly of *Hevea* and *Castilla*. Unfavourable economic factors and the attack of a fungus known as the South American leaf disease have resulted in the practical failure of *Hevea brasiliensis* in the past, while the rubber yield of *Castilla* proved to be low. Blight-resistant and high-yielding varieties of *Hevea*, however, are now produced at a number of tropical stations, but as nearly ten years are required to bring nursery stock to the tapping stage no large quantities of rubber can be expected from this source during the present emergency.

34.26 (54). SARIN, J. L. **The production of khaki shade from vegetable raw materials.** *Curr. Sci.* 11, 1942 (166–7). L.S.

The principal raw materials which have been examined as possible sources of colouring materials, particularly of khaki and grey dyes for Indian army requirements, are noted.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

34.27 : 12.26–8 : 12.11 : 12.14.7 : 21.2–3 : 23.24–6 : 11.47. CHANDLER, W. H. **Deciduous orchards.** Henry Kimpton, 26, Bloomsbury Way, London, W.C.1. 1942. pp. 438. [University of California.]

Although dealing primarily with pomology, this book contains much information which may be applied to trees in general. Chapters are included on the morphological and physiological factors which are the basis of a proper understanding of orchard problems. The propagation, transplanting, and pruning of deciduous fruit trees, the effects of extremes of temperature, the relationship of the roots to the soil, and such related subjects as soil aeration, drainage and water supply are all dealt with. Plant nutrients receive particular attention, separate sections of a chapter being devoted to nitrogen, phosphorus, arsenic, sulphur, chlorine, boron, molybdenum, manganese, zinc, copper, iron, potassium, sodium, calcium, and magnesium. A few genera of nut-bearing trees, such as *Juglans*, *Carya*, *Corylus*, and *Castanea*, are dealt with in the latter part of the book which is, however, in general concerned with trees bearing soft fruits.

34.27 : 12.26–8 (54.8). IYYAR, S. N. C., and REDDY, T. V. **Some common fodder-yielding trees in the Madras Presidency—I, II.** *Indian For.* 68, 1942 (435–46, 536–45). [Agricultural College and Research Institute, Coimbatore.]

A list of the more common fodder-yielding trees, found in the Madras Presidency, with their local names and with short notes on their main characteristics, the part or parts of the plant eaten by cattle, their ecological distribution and the method of propagation. The list is not exhaustive, but includes a large number of trees which produce plenty of foliage, and are fairly quick growing and drought resistant. From these a selection could be made to suit the needs of different localities in the province. The planting of such trees should be encouraged in all waste places and in soils where crops cannot profitably be raised, so that 'fodder-cum-fuel' reserves could be built up.

34.27 : 12.26–8 : 34.26. ZAND, S. J. **Kapok: A survey of its history, cultivation, and uses, with special consideration of its application to thermal and acoustical treatments.** The Author, Forest Hills, New York. 1941. pp. vi + 119. L.S.

The commercially important down known as 'kapok' is the floss surrounding the seeds in the ripened fruit pod of *Ceiba pentandra* Gaertner(= *Eriodendron anfractuosum* D.C.), a member of the Bombacaceae family.

Although this tree has been cultivated for centuries in Java, it is nowhere found there in a wild state. Successful acclimatization of the species in other parts of the world has not always resulted in the successful production of the high quality fibres obtained in Java. The climate and labour conditions of Java are particularly suitable for kapok production. The dry season commences just as the flowers appear and continues until after the harvest, thus ensuring the collection of the floss in an undamaged condition. The Kapok tree is tall, gaunt and straight, with sparse branches growing out at right angles from the trunk. Under cultivation it usually attains a height of 50 to 60 ft., and a diameter of 24 to 26 in. It may be propagated either from seed or from cuttings, but in large-scale planting, seed is usually preferred. It may be grown alone or as a plantation crop. In Java the species is relatively free from pests and diseases. Damage has, however, been caused by *Mudaria variabilis* Rpke., *Alcides leeuweni* Heller, and *Nisotra javana* Motschulsky. Occasionally the cotton stainer, *Dysdercus cingulatus*, attacks the pods, and where cotton is an important crop, Kapok trees are often removed to prevent the harbouring of this undesirable insect. Similarly, in the Belgian Congo, Kapok trees in the neighbourhood of cocoa plantations are cut down as they act as host plants to a serious cocoa pest, *Sahlbergella singularis*. The beetles *Batocera rubra*, *B. hector*, *Monohammus fistulator* and *Plocaederus obesus* have also been known to cause some damage. Fungous diseases include pink disease (*Corticium salmonicolor*), leaf spot (*Ramularia eriodendri*) and root rot (*Fomes noxious*). Among the worst enemies of the tree in Java are parasitic flowering plants of the genus *Loranthus*.

The tree begins to bear seed at the end of the third or fourth year, and the yield in Java is roughly 1 lb. floss for every hundred pods. A mature 10-year-old tree may give 600 pods or more. A by-product of the kapok industry is the seed which yields a yellow, non-drying, practically tasteless and odourless oil which is particularly useful in soap-making, and which, when properly refined, makes a good edible oil. The seed residue is used as fodder for livestock. No use is made of the wood, which is light and soft.

The main chemical constituents of kapok floss are cellulose, pentosan, lignin and cutine, a waxy substance which, combined with cellulose, is highly non-hygroscopic. The outstanding characteristics of the floss are its lightness, resiliency, buoyancy, resistance to water, and its capacity for both thermal and sound insulation. It is also practically immune to fungous and other pests. Used originally only as a packing material for bedding and upholstery, it has recently been employed to a large extent in life-saving equipment, as in water it is capable of supporting up to 38 times its own weight. It does not lend itself easily to spinning and felting, but it has nevertheless been produced in sheet, quilt, and batting form, and is used in this form for the thermal insulation of refrigerators, etc., and in the sound insulation of aeroplane cabins, broadcasting studios, and other places where quiet is required. Chapters are included on cultivation and marketing of kapok, on flame-proofing, and on the individual uses to which the fibre may be put.

34.27 : 12.26–8. FANTI, M. **The mattress-growing tree—Kapok.** *J. Geog.* 42, 1943 (96–103). R.G.S.

A non-technical account of *Ceiba petandra*, its appearance, growth and habitat, and the yield and utilization of its fibres.

34.27 : 12.26–8 (66.9). GREENWOOD, M. **Kapok.** *Farm and Forest* 4, 1943 (61–6 + plate).

Methods for cleaning kapok are discussed and a home-made machine for this purpose is described.

34.27 (54). **Clothes from India's trees.** *Extr.* from *Illus. Weekly India*, Nov. 15th, 1942. *Indian For.* 69, 1943 (121–2).

Substitutes for cotton, wool, and silk have been produced by E. H. Hate from the fibres of Indian plants. The basic cost of his artificial wool is only 1½–2 annas per lb. The substitute material can be used in mixture with animal wool for blankets and clothing. Rope, cordage, belting, brushes, and webbing have also been made from plant fibres.

34.3. Products of the Animal Kingdom

34.3 (66.9). CORBY, H. D. L. **Bee-keeping and honey production in Kontagora Emirate.** *Farm and Forest* 4, 1943 (25–9).

An account of the bee-keeping industry among the natives of Kontagora Emirate (western Nigeria) with particular reference to the methods of processing the honey.

34.6. *Utilization of Logging and Milling Waste*

34.6 (94). **Wealth in wood waste: sawdust of unquestioned value.** *Aust. Timb. J.* 9, 1943–44 (27, 39).

The manufacture of wood-coke, acetone and acetone derivatives are noted among promising outlets for the utilization of sawdust in Australia.

34.6 : 33.06. **Waste wood to major industry.** *Timberman* 44 (7), 1942–43 (10–1).

In addition to Pres-to-logs [cf. *For. Abstr.* 3 (68)] the Wood Briquettes, Inc., now manufactures a briquette fuel, about the size of nut coal, for use in automatic stokers. This new fuel, which is made from wood waste, burns completely, leaving little ash and no clinkers.

34.6 : 33.06 : 07.7. **Sawdust as a useful fuel.** *Wood* 8, 1943 (158).

A description of a small sawdust-fuelled stove designed for heating large workshops. The stove is manufactured by Fulgora Stoves Ltd., London.

34.6 : 33.06 : 33.39. **Uses for sawdust and shavings.** *Leafl. For. Prod. Res. Lab.* No. 25, 1942. pp. 8. [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The possibilities of expanding the use of sawdust and shavings is discussed in relation to fuel, gas purification, wood-cement, packing, and the manufacture of sugar, alcohol, cellulose and fodder. Present uses are listed in the appendix. [Cf. *For. Abstr.* 4 (74–7).]

34.6 : 07.7. **Furnaces and stoves for burning sawdust.** *Leafl. For. Prod. Res. Lab.* No. 26, 1942. pp. 11. [Forest Products Research Laboratory, Princes Risborough, Bucks.]

Illustrated descriptions are given of various types of burners, including furnaces, drum-stoves operated on single charges, drum-stoves for continuous operation, converted standard stoves and incinerators. [Cf. *Wood* 7, 1942 (70–2).]

34.6 : 33.38.1 (79.5–7). LOUTTIT, J. E. **Charcoal and carbon from wood waste.** *Chemurgic Dig.* 2, 1943 (14–5). *Abstr.* in *Bull. Inst. Paper Chem.* 13, 1943 (342–3). P.O.

The author points out that charcoal made from woods of the western United States can be substituted for charcoal made from eastern hardwoods and suggests that the new chemical and metallurgical industries in the Northwest should be supplied with material produced from the abundant wood waste in that region rather than by importing charcoal from elsewhere in the United States.

34.6 : 33.38.2. **Running on sawdust: a gas-producer in service on timber lorry.** *Timb. Tr. J.* 165, 1943 (486).

A gas-producer unit operated on sawdust is stated to be giving satisfactory service; it is used daily for 5-ton deliveries, it requires 1½–2 lb. of sawdust per mile and can run 80–100 miles before being recharged. The unit is found to be much cheaper than coal-burning producers, is quicker in starting, and requires no attention during the working week except for refuelling. Altogether 3 hours a week are required for refuelling and cleaning the filters. About a gallon of tarry residue forms every 12 miles. This is collected in a settling tank which is emptied twice a day.

34.6 : 33.38.2. **Sawdust as an efficient transport fuel.** *Comm. Mot.* 76, 1942 (374–5). L.S.

A brief discussion of the relative efficiency for producer fuel of sawdust in the raw state and in the form of carbonized briquettes. A sawdust-burning producer-gas plant, constructed by British Vehicle Producer Gas, Ltd., is described and illustrated. [Cf. *For. Abstr.* 4 (244).]

34.6 : 34.24. BENSON, H. K. **Chemurgic use of the forest crop.** *Chemurgic Dig.* 1, 1942 (188–9). *Abstr.* in *Bull. Inst. Paper Chem.* 13, 1943 (342). P.O.

After brief mention of efforts to utilize the pulp-mill liquors profitably, reference is made to other advances in the industrial use of forest wastes in the State of Washington, such as cork from Douglas Fir bark, metallurgical wood coke from forest waste of any kind, and tannin extract from Hemlock bark.

34.6 : 34.26. BELANI, E. **Value of wood waste for the production of templin oil, Pine-needle oil, turpentine oil and refined turpentine, Pine oil and softwood tar.** *Dtsch. ParfümZtg.* 27, 1941 (264–7). [G.] *Chem. Zbl.* 1, 1942 (2335). Chem. Abstr. 37 (3621). P.R.

Methods of production are discussed.

34.6 : 31.3. **Utilisation of lignin waste.** *Sci. & Cult.* 8, 1942 (125–6). L.S.

Less than ·05 per cent. of the 3 million tons of lignin available annually in Canada and the United States is at present utilized, but research indicates that lignin may one day be the basis of important chemical industries. The Marathon Paper Mills of Rothschild have already produced a number of useful derivatives from calcium lignin sulphonate precipitated from waste liquors by the addition of lime. Vanillin, tanning chemicals, water softening agents, road-binding materials and plastics may all be derived from the lignin waste of the paper-pulp industry.

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.1 : 31.45. STEINER, A. J. **Method of fire-hazard classification of building materials.** *Bull. Amer. Soc. Test. Mat.* No. 121, 1943 (19–22). P.O.

Methods and equipment used in testing the fire-hazard characteristics of building materials are described. For purposes of classifying materials in this respect, cement asbestos board is taken for the zero point of a numerical scale and select Red Oak lumber for the 100 point in a decimal rating classification. A report is included on the performance under test of these two materials and of three additional building materials.

38.2. HOBACK, W. G., WEISS, H. L., and PHELAN, V. B. **Building materials and structures. Report BMS89. Structural properties of 'Precision-Built Jr.' (Second construction), prefabricated wood-frame wall construction sponsored by the Homasote Co.** U.S. National Bureau of Standards. 1942. pp. ii + 15.

38.2 (410). **Timber houses: Building Committee urges immediate adoption of mechanised production methods.** *Timb. Tr. J.* 165, 1943 (487–8).

In its first report, the Committee for the Industrial and Scientific Provision of Housing, which was formed in November, 1941, advocates *inter alia* factory production of houses or parts thereof made of timber, including plywood.

38.2 (54) : 12.26–8. LIMAYE, V. D. **Detailed design of timber roof trusses made with wooden disc dowel joints.** *Indian For. Leafl.* (*Utilisation*) No. 33, 1943. pp. 13 + figs. [Forest Research Institute, Dehra Dun.]

Full details are given of the method of designing timber structures fitted with wooden disc dowel joints, together with a complete design, including working drawings, of a 45-ft. roof truss to be constructed of Sal (*Dalbergia sissoo*) timber with disc dowels of Babul (*Acacia arabica*) wood. [Cf. *For. Abstr.* 4 (244), 5 (58).]

38.2 : 31.27 : 12.26–8. LIMAYE, V. D. **Note on timber roof trusses with solid wood disc dowel joints.** *Indian For. Rec.* (*n.s.*) *Utilisation* 3 (1), 1943. pp. 7 + plates. [Forest Research Institute, Dehra Dun.]

A brief account of the advantages of modern roof trusses constructed entirely of timber with solid wooden disc dowels and a few bolts. [Cf. *For. Abstr.* 4 (244).]

38.2 : 33.15. GOMME, E. D. **Improvements relating to pre-fabricated portable huts, sheds, houses and the like.** *British Patent* No. 548,340, Oct. 1942. pp. 28 + plates. P.R.

38.2 : 33.15. GOMME, E. D. **Improvements relating to pre-fabricated portable huts, sheds, houses and the like.** *British Patent* No. 548,374, Oct. 1942. pp. 26 + plates. P.R.

These patents relate to structures the walls of which, with or without roof, consist of prefabricated sections socketed or rabbetted together, each consisting of an inner and outer skin of material, such as plywood, wall board, asbestos board or the like, separated by air space and a core of strips of wood.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42 : 12.26–8 : 24 : 44.3 : 12.21. SUBBA RAO, M. K. **The deterioration of Grevilleas on South Indian tea plantations.** *Pap. Tea sci. Sect. unit. Plant. Ass. sth. India* No. 3, 1942. pp. 12. R.A.M. 22 (181).

The unthrifty condition of *Grevillea* [*robusta*] in southern India is due mainly to meteorological factors, impoverished soil fertility, root competition and the ageing of the trees, the part played by fungi(*Phyllosticta* sp. and *Cercospora* sp.) being purely secondary. Measures are indicated whereby the trees may be maintained in a healthy and vigorous condition. They include an age limit of 25 years for standing trees, selection of seed from the better-grown individuals in areas of poor development, and pollarding in wind-swept regions.

42.1. *Air Currents*

42.1–2 : 23.27. SKINNER, H. T. **Winter protection of evergreens.** *Bull. Morris Arbor.* 4, 1942 (23–5). L.S.

Although hardy, established plants do not usually require protection over the winter it is often advisable to protect tender plants, those recently set out, and those in particularly exposed situations. Winter injury may be the result of various conditions, but is most commonly due to evaporation from the leaves of more water than the roots are able to replace, as when the plant is exposed to drying winds, bright sunshine, or low humidities while the roots are still in a state of dormancy. The aim of protection is to correct this condition either by reducing the rate of evaporation from the leaves or by keeping the roots functioning properly. Practical suggestions are made for the prevention of the various kinds of winter injury.

42.2. *Temperature Influence*

42.21 : 12.25 : 31.1. STONE, E. L. **Frost rings in Longleaf Pine.** *Science* 92 (*n.s.*) (2395), 1940 (478). [Southern For. Exp. Sta.] L.S.

Microscopic examination of a conspicuous yellow- to tan-coloured zone in the springwood of the 1932 ring in 1- and 2-year-old shoots of *Pinus palustris* growing in southern Mississippi revealed laterally displaced rays, distorted xylem elements, and short-celled parenchyma characteristic of frost injury.

42.3. *Precipitations*

42.32 : 12.25 : 22.88.2. MCCULLOCH, W. F. **Ice breakage in partially cut and uncut second growth Douglas-Fir stands.** *J. For.* 41, 1943 (275–8). [State Board of Forestry, Salem, Ore.]

A survey of the damage to partially cut and uncut second-growth stands of Douglas Fir following a severe ice storm in western Oregon showed the following results.

Per cent. of trees cut	*Class of trees cut*	*Per cent. of residual stand lost*
36	largely intermediate	41
16	largely dominants and codominants	68
60	all classes	37 (by snow break) (75 of remainder by ice damage 6 years later.)

42.5. *Chemical Influences. Nutrient Deficiencies*

42.5 : 12.26–8 : 45.3. CHANDLER, S. C., and FLINT, W. P. **Oil injury to woodlands.** *Arborists' News* 6 (3), 1941 (17–8). Biol. Abstr. 17 (12393).

Oil sprays of various types applied as insecticides to second-growth trees averaging 20 ft. in height resulted in severe injury to certain species. Dogwood, Wild Crab, Hazel, and White Oak suffered least, but Ash, Elm, Red and Black Oak, Persimmon, Wild Plum and Red Bud were seriously injured by some of the sprays. Nearly all the sprays applied resulted in death or severe injury to Hickory. Many of the severely injured trees subsequently died owing to attack by bark beetles and other insects.

42.5. WALLACE, T. **The diagnosis of mineral deficiencies in plants by visual symptoms: a colour atlas and guide.** H.M. Stationery Office, London. 1943. pp. vi + 116. [University of Bristol Agricultural and Horticultural Research Station, Long Ashton, Bristol.]

43. FOREST FIRES

43. SCHROEDER, G. H. **Forest fire manual.** OSC Co-operative Association, Corvallis, Oregon. 1941. pp. vi + 80.

An outline of forest-fire protection for the use of forestry students undertaking vacation work in the employ of forest protection agencies.

43.0. *Predisposing Factors and Causes*

43.01 : 11.16.2. GISBORNE, H. T. **New facts on lightning.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 24, 1942. pp. 3.

It appears that the long-duration white-flash type of lightning stroke, which persists for a fractional part of a second, is most dangerous in causing forest fires. While the extremely short red flash will blow trees apart, it probably seldom starts fires.

43.1. *Protective Measures*

43.1 (74.8) : 81 : 92. PENNSYLVANIA. **Pennsylvania forest protection laws and organization.** *Circ. Pa. Dep. For. Waters* No. 23 (revised ed.) 1942. pp. 46.

43.11. **Measurement of forest fire danger variables in Region One. 2. Fuel moisture content. A. Half-inch**

wood cylinders. [Northern Rocky Mountain Forest and Range Exp. Sta.] 1941. pp. 6.

Instructions are given for the use of ½-in. wood cylinders as fuel-moisture-indicator sticks in rating forest fire danger in Region One of the U.S. Forest Service. The same type of stick is used at all fire-danger stations throughout the western United States; it is made of Ponderosa Pine sapwood and is trimmed to weigh 100·0 gm. when oven-dry.

43.11. **Measurement of forest fire danger variables in the Northern Rocky Mountain Region. 7. Integration of measurements.** Northern Rocky Mountain Forest and Range Exp. Sta. 1942. pp. 15 + plate.

A detailed account is given of the functions of and principles involved in the operation of two meters for use in determining forest-fire hazard—the 'Burning Index' and 'Fire Danger' meters. By applying to the first meter information on season of year, relative humidity, current fuel moisture, and wind, the burning index is determined. This together with information on visibility and lightning, applied to the second meter, gives the fire-danger class for the area and time to which the data apply. These meters are for use in the Northern Rocky Mountain Region.

43.12 : 07.7. SHALLENBERGER, G. D., and LITTLE, E. M. **Visibility through haze and smoke, and a visibility meter.** *Repr.* from *J. opt. Soc. Amer.* 30 (4), 1940 (168–76).

In this paper air clarity is defined as the distance from an observer to a black ridge, or dark building, or some similar object when it is barely visible against the horizon sky. An expression is derived for visual range in miles of a small smoke such as might be detected from a forest lookout. Visual range depends on direction with respect to the sun, clarity, height of smoke layer, binocular power, and Fechner's constant for the observer.

A visibility meter is described for use in measuring the distance a small smoke should be visible. In use it is placed over one objective of a binocular.

43.12 : 07.7 : 11.16.2 WRIGHT, J. **A lightning protection system for forest lookout structures.** *For.-Fire Res. Note* No. 11, 1942. pp. 11 + dgms. [Dominion Forest Service, Ottawa.]

This note describes methods of protecting forest lookout structures against lightning damage and gives details of construction and the materials required. Safety rules for protection during a thunderstorm are listed. In a supplementary memorandum consideration is given to methods of protection that do not require the use of copper materials at present unavailable.

43.13. PRIAULX, A. W. **Controlling bomb set forest fires.** *Timberman* 44 (8), 1942–43 (20–2).

The shape, size and characteristics of various types of incendiary bombs are described briefly and information is given on the best method for controlling each type.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.3. *Fungi*

44.3 (83): 12.26–8: 12.21: 12.25. Principales enfermedades parasitarias que fueron objecto de consulta en el segundo semestre (Julio–Diciembre) de 1941. [**The principal parasitic diseases which were the subject of consultation during the second half (July to December) of 1941.**] *Bol. Sanid. veg., Santiago* 1 (2), 1941 (52–5). [Span.] R.A.M. 22 (241).

Included in this tabulated list of plant pathogens investigated by the phytopathological staff of the Chilean Ministry of Agriculture from July to December, 1941, is *Melampsora bigelowii* on *Salix nigra*. Among the non-parasitic diseases listed separately on p. 56 of the *Boletin* is needle fusion of *Pinus insignis*.

44.3 : 12.25 : 12.21. **Rust disease of Norway Spruce.** *Gdnrs.' Chron.* 113, 1943 (127). O.B.D.

Serious damage to Norway Spruce was reported last autumn from various localities due to attack by a leaf-shedding rust fungus, *Chrysomyxa rhododendri*, whose alternate host is the Alpine Rose, *Rhododendron kirsutum*. Although well-known on the Continent, the disease has so far been comparatively rare in Britain.

44.3 : 23.26 : 12.26–8 : 12.25 : 12.21 : 42 : 11.43.1. DAVIS, W. C., WRIGHT, E., and HARTLEY, C. **Diseases of forest-tree nursery stock.** *For. Publ. civ. Conserv. Corps* No. 9, 1942. pp. iv + 79 + plate. [U.S.D.A. Bureau of Plant Industry.]

Information is given on the causes of the most frequently encountered nursery diseases of both conifer and broadleaf species, and on chemical treatments and general nursery practices calculated to reduce losses in seeds and young plants through disease. Only diseases affecting trees less than four years old are dealt with. Attention is given to such factors as the selection and preparation of nursery sites, drainage and sanitation, treatment of seeds, soil fertilization and transplanting, digging, and shipping. Diseases due to causes other than fungi are described, and fungous diseases of broadleaf and conifer species are dealt with separately, special attention being given to methods of control. Notes are included on some diseases which are confined to specific hosts.

44.3 (71.5–6) : 12.26–8 : 12.21. EHRLICH, J. **Occurrence of *Gonatorrhodiella highlei* in Nova Scotia and New Brunswick.** *Mycologia* 34, 1942 (705). R.A.M. 22 (185).

The author records the occurrence of *Gonatorrhodiella highlei* in association with *Nectria coccinea* and the woolly Beech scale (*Cryptococcus fagi*) on diseased Beech stands throughout Nova Scotia and in Albert County, New Brunswick, during the summers of 1930, 1931, and 1932.

44.3 : 12.26–8 : 12.25 : 12.21. GERMANY. Wissenschaftlicher Jahresbericht der Biologischen Reichsanstalt für Land- und Forstwirtschaft, 1940. [**Scientific annual report of the National Biological Institute for Agriculture and Forestry, 1940.**] *Mitt. biol. Anst. (Reichsanst.) Berl.* No. 65, 1941. [G.] *Abstr.* in *Z. PflKrankh.* 52 (11), 1942 (513–6). R.A.M. 22 (161).

The following items from this report are of forest pathological interest. Inoculation experiments by H. W. Wollenweber and K. Röder with *Graphium (Ceratostomella) ulmi* on a dozen Elms of the Christine Buisman variety failed to induce a trace of infection. Within the old focus of infection at Feldkirch, Vorarlberg (Ostmark) *Phaeocryptopus gaeumanni* was detected on the green (*viridis*) form of Douglas Fir (*Pseudotsuga taxifolia*).

44.3 (79.4) : 12.26–8 : 12.21. HARRIS, M. R. **The behaviour of *Endothia parasitica* on Chestnut trees in California.** *Bull. Calif. Dep. Agric.* 31 (3), 1942 (99–109). E.S.R. 88 (650).

Chestnut blight, known to have been in California since 1934, has spread from one orchard to two others in the San Joaquin Valley, but the spread has been slow as compared with that in the Eastern States. All infected trees in these orchards were destroyed, and those subsequently developing infection were similarly treated at two annual inspections. Most of the cankers were found at the base of the tree. Earthen dikes were built to protect the trees in two of the orchards against infection from irrigation water. The disease has decreased as inspection and eradication have continued. No ascospores have been known to develop in the California area, probably due to the very light summer rainfall. Other environmental factors do not differ greatly from those in the East. It is believed that the disease can be eliminated by preventing spread through irrigation water or contaminated tools.

44.3 (74–6). HEPTING, G. H. **Reducing losses from tree diseases in eastern forests and farm woodlands.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 1887, 1942. pp. 22. [U.S.D.A. Bureau of Plant Industry.]

Tree diseases, particularly wood rots, cankers, and leaf diseases, are dealt with from the point of view of the farm woodland owner, and suggestions are given for their control wherever practicable. The value of pruning in the prevention of decay through the removal of dead branches which might introduce rot is emphasized, but green pruning should be confined to branches not more than 2 in. in diameter unless wound dressings are to be applied. Care should be taken in opening up stands of the Beech/Birch/Maple/Hemlock type, as sudden exposure of these species may result in the death of the remaining trees. Notes are added on diseases new to the United States, on the prevention of deterioration in logs and lumber, and on species requiring special attention, viz. Aspen, Balsam Fir, Beech, Birch, Maple, Black Walnut, Hemlock, Oaks, Southern Pines, White Pine, and Yellow Poplar.

44.3 : 12.26–8 : 12.21. JENKINS, A. E. **Leaf spot on *Terminalia arjuna*.** *Phytopathology* 33, 1943 (404–5). [Bureau of Plant Industry Station, Beltsville, Md.]

A severe leaf spot, apparently of fungous origin, was observed in 1937 on *Terminalia arjuna* Wight and Arn. in the U.S. Plant Introduction Garden at Coconut Grove, Dade County, Florida. The disease may appear on any part of the blade causing spots usually 2–8 mm. in diameter. The necrotic area becomes dry and shrunken and much of the dead tissue may fall away causing severely infected leaves to present a very ragged or insect-eaten appearance. Among the organisms isolated were *Phomopsis* sp. and *Pestalotia disseminata*. Pycnidia of the nature of *Phyllosticta* were present on the lesions.

44.3 : 12.26–8 : 12.21. JENKINS, A. E. ***Sphaceloma* causing scab of *Magnolia grandiflora*.** *Trees, Sta. Monica, Calif.* 5 (6), 1943 (15).

A new, probably indigenous species of *Sphaceloma* has been identified on the leaves of *Magnolia grandiflora* from Georgia and Mississippi. It produces slightly raised, circular or irregular grey spots on the upper side of the leaf. The spots may be scattered over the entire blade or be most numerous along the midrib or in the marginal region. When abundant they discolour the leaf blade. The tissue of severely infected leaves may be killed.

44.3 : 12.26–8 : 12.21. JENKINS, A. E., and GRODSINSKY, L. ***Sphaceloma* on Willow in New Zealand.** *Repr.* from *Trans. Brit. mycol. Soc.* 26 (parts I & II), 1943. pp. 3. I.M.I.

A fungus reported in an earlier paper as causing a leaf disease of *Salix fragilis* and *S. babylonica* in New Zealand is considered as a new species of *Sphaceloma*. A latin diagnosis is given for the fungus which is named *Sphaceloma murrayae* sp. n.

44.3 : 12.21 : 13.2. JONES, T. H., and MOSES, C. S. **Isolation of *Ceratostomella ulmi* from insects attracted to felled Elm trees.** *J. agric. Res.* 66, 1943 (77–85). [U.S.D.A. Bureau of Entomology and Plant Quarantine.] O.R.E.

In order to ascertain what species of insects were carrying the Dutch Elm disease pathogen (*Ceratostomella ulmi* Buisman), insects attracted to felled healthy Elm trees in New Jersey in 1936 were collected, identified and cultured. Twenty-three species were identified, and many others were related to genus or family only. *C. ulmi* was isolated most frequently from *Scolytus multistriatus* (Marsh.) and *Hylurgopinus rufipes* (Eich.). It was isolated less frequently from *Xylobiops basilaris* (Say), *Conotrachelus anaglypticus* (Say), *Xylosandrus germanus* Bldfd., and *Magdalis armicollis* (Say). As *S. multistriatus* and *H. rufipes* appeared to be the most important vectors, these two species were cultured again in 1937, 1938, and 1939. *C. ulmi* was obtained from 6·9, 5·8, 7·7, and 5·7 per cent. of the *S. multistriatus*, and from 4·3, 2·4, 3·3 and 0·7 per cent. of the *H. rufipes* cultured in 1936, 1937, 1938, and 1939 respectively.

44.3 : 12.25 : 12.21. SLAGG, C. M., and WRIGHT, E. ***Diplodia* blight in coniferous seedbeds.** *Phytopathology* 33, 1943 (390–3). [U.S.D.A. Bureau of Plant Industry, Lincoln, Nebraska.]

First-year seedlings of Douglas Fir (*Pseudotsuga taxifolia*), Austrian Pine (*Pinus nigra*), Ponderosa Pine (*P. ponderosa*) and Piñon Pine (*P. edulis*) in a nursery at Manhattan, Kansas, were heavily infected by a blight caused by a fungus identified as *Diplodia pinea* (Desm.) Kickx. Injury to Douglas Fir and Ponderosa Pine seedlings was particularly severe. Three-year-old plantings of Austrian and Scots Pine (*P. sylvestris*) were similarly infected and the disease was also found on needles, needle bases, bark and cone scales of 'dieback' branches of mature trees of *P. nigra*, *P. ponderosa*, *P. pungens*, *P. rigida* and *P. sylvestris*.

Uninjured seedlings of *P. nigra* were killed in 30 days by mycelial inoculations with a single-spore culture of the fungus. Typical pycnidia appeared 15 days after inoculation. There was wide variation in the septation of pycnospores on different hosts and different plant parts.

44.3 : 12.26–8 : 12.21. TARTAKOWSKY, S. G., and ARENTSEN, S. T. La roya del Alamo en Chile. **[The Poplar rust in Chile.]** *Bol. Sanid. veg., Santiago* 1 (2), 1941 (21–32). [Span.] R.A.M. 22 (229).

Poplars in Chile, especially the widely cultivated *Populus nigra* var. *italica*, suffer severely from the rust *Melampsora larici-populina*. Although the disease was successfully combated in young (two- to three-year-old) plantings in 1939–40 by spraying with 0·75–1·0 per cent. Bordeaux mixture, such a measure would be totally impracticable in the case of adult trees, which reach a height of 30 m. Control must therefore be based on

the cultivation of resistant species, varieties and hybrids, the most promising among those hitherto tested being *P. angulata*, *P.* sp. ('Calcufilo'), 'Arnaldo Mussolini' (*P. canadensis* × *P. nigra*), and German hybrid No. 7; specimens of *P. vernirubens* from Canada and ten hybrids from the United States proved susceptible (extremely so in some cases) to *M. larici-populina*.

44.3 : 12.26–8 : 12.21. Davis, S. H. **Poplar canker. A note on the susceptibility of various Poplar species.** *Bull. Morris Arbor.* 4, 1942 (28). L.S.

Nineteen species and varieties of Poplars growing in the nursery of the Morris Arboretum were examined for susceptibility or resistance to *Dothiciza* canker. The following 9 species and varieties showed no cankering:– *Populus alba nivea*, *P. alba richardii*, *P. brevifolia*, *P. euphratica*, *P. generosa*, *P. maximowiczii*, *P. tomentosa*, *P. trichocarpa*, and 'Geneva' Poplar. Those species and varieties exhibiting frequent or severe cankering were:—*P. acuminata*, *P. berolinensis*, *P. canadensis*, *P. nigra betulifolia*, *P. nigra italica*, *P. petrowskyana*, *P. przewalskii*, *P. sargentii*, *P. simonii fastigiata*, and *P. suaveolens*.

44.3 : 12.26–8 : 12.21. Tehon, L. R. **Canker of Pacific Dogwood and Madrona.** *Amer. Nurserym.* 77 (9), 1943 (24–5).

Pacific Dogwood (*Cornus nuttalli*) and Madrona (*Arbutus menziesi*) are sometimes attacked by *Phytophthora cactorum* which causes a girdling canker and which may kill the tree. Inoculation experiments resulted in very large cankers on these species after a period of 13 weeks, and also showed the following species to be more or less susceptible to the disease:— Oregon Maple (*Acer macrophyllum*), Red Alder (*Alnus rubra*), Scouler Willow (*Salix scouleriana*), California Hazel (*Corylus californica*), and Douglas Fir (*Pseudotsuga taxifolia*). A method of treatment by removing the canker (scarification) is described.

44.3 : 12.26–8 : 12.21. Tehon, L. R. **Mimosa wilt is major tree disease problem.** *Amer. Nurserym.* 77 (7), 1943 (18–9).

Mimosa wilt disease, first discovered at Tryon, North Carolina in 1935, now extends from Richmond, Va., southward to La Grange, Ga., and inland from Norfolk, Va., and Bishopville, S.C., on the coastal plain, to Biltmore in the mountains of North Carolina. It appears to be an exotic disease and was probably introduced into the United States on *Albizzia lebbek*, which is mildly susceptible, or on some other susceptible species. Inoculation experiments with Black Locust (*Robinia pseudoacacia*), Honey Locust (*Gleditsia triacanthos*), Redbud (*Cercis canadensis*), and Catalpa (*Catalpa speciosa*) showed that these species are immune. *Albizzia lophantha* and *A. kalkora* are highly susceptible, but a species introduced recently from the Far East (*A. thoreli*) appeared to be immune. As infection takes place usually through the roots the disease is very difficult to combat, eradication of the wilt fungus (*Fusarium* sp.) being impossible except by such costly methods as steam or chemical sterilization of the soil. Spread of the disease may be controlled to some extent by preventing the removal of trees from infected to uninfected districts. Sterilization of pruning tools and avoidance of tree wounds will help to prevent the disease from spreading. Attempts are being made to breed a resistant type of Mimosa.

44.3 : 12.26–8 : 12.21. Tehon, L. R. **Persimmon wilt.** *Amer. Nurserym.* 77 (11), 1943 (18).

Observations on the occurrence and frequency of Persimmon wilt in the United States show that, since its discovery in 1937, the disease has persisted, and is increasing in some areas. The causal agent is a fungus of the genus *Cephalosporium*. So far it has not been possible to control the disease, which is sometimes fatal. The spread of Persimmon wilt between 1937 and 1942 is traced. The disease is found to be increasing, particularly in regions such as north central Florida where Persimmon is abundant, and decreasing in regions such as western Florida where Persimmon is scarce.

44.3 (51) : 12.25 : 12.26–8 : 12.21. Teng, S. C. **Studies of Chinese timber trees in reference to forest management. I.** *Sinensia* 10, 1940 (363–95). [E.chin.] R.A.M. 22 (233).

The following observations were made on the wood-destroying fungi encountered in the course of the writer's ecological studies of the forests of north-western Yunnan and south-eastern Sikang (East Tibetan Plateau) in relation to silvicultural procedure. The Yunnan Pine (*Pinus yunnanensis*) suffers extensively from a gall rust (? *Cronartium quercuum*), especially in open and pure stands on exposed sites. The same tree is a host of *Fomes laricis*, the agent of a brown, cubical heart rot, also affecting other conifers. A pecky heart rot of *P. yunnanensis*, Chinese Larch (*Larix potaninii*), Likiang Spruce (*Picea likiangensis*), Hemlock (*Tsuga yunnanensis* and *T. chinensis*), and probably also the Firs, *Abies georgei* and *A. chensiensis*, is caused by *F. pini* throughout the range of the investigations. The rot, which may extend into the sapwood, is characterized by numerous elongated pockets, usually filled with white fibres, the surrounding heartwood often being stained purplish or reddish, while the decayed areas themselves may be intersected by narrow, brownish to blackish lines. *F. putearius* Weir induces a decay very similar to that caused by *F. pini* in *P. likiangensis*, *A. georgei*, and probably also *L. potaninii*.

A prevalent, brown, cubical heart rot of the upper part of *P. likiangensis* trunks is caused by *F. carneus*, the decay apparently proceeding more rapidly after the death of the trees. *Polyporus dryadeus*, a well-known Oak parasite, attacks *A. georgei* in south-eastern Sikang, inducing a soft, white rot of the butt and root. *P. volvatus* is found in abundance on *Pinus yunnanensis* trunks. A white pocket rot of *Picea likiangensis* sap and heartwood is caused by *Stereum sulcatum* and *S. chailletii*, while *S. sanguinolentum* is the agent of a similar decay of *Abies* and *Tsuga* spp. A powdery, brown rot of Red Paper Birches (*Betula albo-sinensis*) in Sikang is due to *Polyporus betulinus*. *P. gilvus* produces a white rot of Prickly Oak (*Quercus semicarpifolia*) sapwood, which often cracks along the annual rings. Various broadleaved trees, including Birch, Oak, and Poplar, are subject to the pocket sapwood rot caused by *P.* [*Polystictus*] *pergamenus*, many hardwoods also being attacked by *P. versicolor*, the agent of a white spongy decay of the sapwood. The Prickly Oak is also host of *Trametes sepium*, which caused a brown, crumbly rot of the sapwood and heartwood. A white spongy decay of many kinds of Poplars is attributable to *T. hispida*.

The following fungi, already reported from the Hunba Forest [*Sinensia* 10, 1939 (249–68)], have likewise been

encountered in the regions under observation:—*F. pinicola* on *Pinus yunnanensis, Picea likiangensis, Abies georgei*, and *Larix potaninii*; *F. annosus* on *P. likiangensis* and *A. georgei*; *F. fomentarius* and *Ganoderma applanatum* on Prickly Oak and Red Paper Birch; *F. igniarius* on the last-named, Poplar, and Willow [*Salix*]; *P. abietinus* on *Pinus yunnanensis, Picea likiangensis*, and *A. georgei*; *Polyporus schweinitzii* on *L. potaninii* and *A. georgei*; *P.* [*Polystictus*] *hirsutus* on Red Paper Birch; and *Lenzites sepiaria* on *Pinus yunnanensis*.

44.3 : 12.11.3 : 12.26–8 : 12.25 : 12.21. United States. **Report of the Chief of the Bureau of Plant Industry, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 27.

Strains of certain tree species have been found to be relatively resistant to diseases to which the tree species, or the genus in general, are highly susceptible. Further studies are being made with some of the resistant strains, including Asiatic Chestnut resistant to blight (*Endothia parasitica*), hybrid Elms apparently resistant to the Dutch Elm disease (*Ceratostomella ulmi*), Mimosa apparently resistant to the wilt (*Fusarium* sp.), White Pine resistant to blister rust (*Cronartium ribicola*), Persimmon species resistant to Persimmon wilt (*Cephalosporium* sp.), and Flowerfield and Shipmast varieties of Black Locust resistant to heart rot and decay (p. 14).

44.3 : 12.26–8 : 12.25 : 12.21. United States. **Service and regulatory announcements. List of intercepted plant pests, 1941.** *S.R.A., B.E.P.Q., U.S. Dep. Agric.* 1942. pp. 50. R.A.M. 22 (176).

In the notes accompanying these lists of the pests and diseases intercepted on plant products entering the United States from 1st July, 1940, to 30th June, 1941, it is stated that Dutch Elm disease (*Ceratostomella ulmi*) was again found on several lots of Elm-crating from England. A new disease tentatively identified as due to *Sclerotinia kerneri*, a Fir pathogen described from Austria and not known to occur in North America, was found on Christmas trees (*Abies balsamea*) from Newfoundland and on 'greens' (*Abies* sp.) from Nova Scotia.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

45.11 : 23.1 : 12.25 : 34.21. Young, V. A., Doll, G. B., Harris, G. A., and Blaisdell, J. P. **The influence of sheep grazing on coniferous reproduction and forage on cut-over Western White Pine areas in northern Idaho.** *Bull. Univ. Idaho* 37 (6), 1942. pp. 46.

In the investigations described it was found *inter alia* that moderate grazing by sheep was beneficial to Western White Pine reproduction, but had little effect on the other conifers present (*Pseudotsuga taxifolia, Larix occidentalis, Thuja plicata*, and *Abies grandis*), whereas overgrazing was detrimental to the reproduction of all the coniferous species (with White Pine suffering least) and tended to bring about the replacement of the more palatable forage plants by less desirable ones. The beneficial effect of moderate grazing on White Pine regeneration may be due, among other causes, to the exposure of the mineral soil, which would seem to offer a better germination medium than duff, and to the scarification of the seed when it is trampled.

45.12. Roper, G. **Extermination of rabbits.** *Quart. J. For.* 37, 1943 (88–9).

As a result of fairly complete rabbit extermination from the writer's estate, the cost of planting has been approximately halved.

45.12 : 12.19.2 : 12.26–8 : 13.2. Schilling, E. A. **Forage utilization by the white-tailed deer of the Appalachian region.** *Abstr.* in *J. Elisha Mitchell sci. Soc.* 58, 1942 (141–2). L.S.

Studies have been made on the Pisgah National Game Preserve to determine the plants, in order of preference, that were browsed by deer. The following major types, in order of total acreages involved, were studied and classified from the standpoint of deer food value:—Oak Chestnut, cove hardwoods, Yellow Pine hardwoods, northern hardwoods, fields, Spruce Balsam, lake and barren. Important timber trees browsed extensively by deer during the reproduction stage are Yellow Poplar, Basswood, White Oak, Red Oak, Maple, White Ash and Magnolia. It was found that abnormally high deer populations can seriously damage forest vegetation.

45.3. *Insects*

45.3 (71) : 05.3. Canada. **Annual report of the Forest Insect Survey, Forest Insect Investigations, Division of Entomology, Science Service, 1942.** King's Printer, Ottawa. 1943. pp. 12.

During 1942 13,210 collections of forest insects were made throughout Canada. Notes are given on the occurrence and activity of the insects arranged under their respective tree-host species. Decreases were recorded for a number of insects, particularly the European Spruce sawfly (*Gilpinia hercyniae*) and the Larch sawfly (*Pristophora erichsonii*). The other important insects of the year were the Spruce budworm (*Cacoecia fumiferana*) on Spruce and Balsam Fir and the variety of this Tortricid that attacks Jack Pine, the forest tent caterpillar (*Malacosoma disstria*) on Poplar, and the Birch leaf skeletonizer (*Bucculatrix canadensisiella*). There was a sudden outbreak of spring canker-worm (*Paleacrita vernata*), Basswood looper (*Erannis tiliaria*), and fall cankerworm (*Alsophila pometaria*) in Ontario and Quebec. Maple, Basswood, Yellow Birch, White Ash and White Elm were attacked.

45.3 (71). Twinn, C. R. **A summary of the more important crop pests in Canada in 1941.** *Seventy-second annu. Rep. ent. Soc. Ontario, 1941* 1942 (47–56). [Division of Entomology, Department of Agriculture, Ottawa.] I.I.E.

There was a marked decline during 1941 in the abundance of the European Spruce sawfly (*Gilpinia hercyniae* Htg.). The Spruce budworm (*Archips* [*Cacoecia*] *fumiferana* Clem.), however, was a serious pest in some areas in Ontario, Quebec, New Brunswick, Manitoba and elsewhere. Bark beetles caused damage in a number of places ranging from northwestern Ontario to British Columbia, and the European Pine shoot moth (*Rhyacionia buoliana* Schiff.) continued to spread in southern Ontario. There was a general decline in the numbers of the Larch sawfly (*Pristiphora erichsoni* Htg.) throughout eastern Canada, but the bronze Birch borer (*Agrilus anxius* Gory) continued to be a pest of major importance in the Maritime Provinces. The Beech scale (*Cryptococcus fagi* Baer.) extended northward in New Brunswick, and the fall cankerworm (*Alsophila pometaria* Harr.) was a serious pest of deciduous trees

throughout the prairies. Reports of defoliation by the Mountain Ash sawfly (*Pristiphora geniculata* Htg.) were received from various parts of eastern Canada, and extensive outbreaks of the forest tent caterpillar (*Malacosoma disstria*) occurred, particularly in northern Ontario, British Columbia, and the Yorkton district of Saskatchewan.

45.3 : 12.25 : 13.2. CONKLIN, J. G. **An analysis of the biological control of the European Spruce sawfly in New Hampshire, with particular reference to predators.** *Abs. Doctoral Diss. Ohio St. Univ.* No. 37, 1942 (63–73). E.S.R. 88 (511).

The marked reduction in the sawfly population during the years of the investigation here reported could not be attributed to the activities of predators, as it was brought about chiefly by an unidentified disease that affected the larval stages.

45.3 : 13.2 : 12.25. MORRIS, R. F. **Preliminary notes on the natural control of the European Spruce sawfly by small mammals.** *Canad. Ent.* 74, 1942 (197–202). [Dominion Entomological Laboratory, Fredericton, N.B.] I.I.E.

In eastern Canada up to 40–50 per cent. control of the European Spruce sawfly (*Gilpinia hercyniae* Htg.) may be effected under epidemic conditions by small forest mammals, particularly the cinereous shrew (*Sorex cinereus cinereus* Kerr). There is considerable seasonal fluctuation in the small mammal population. Shrews and rodents generally prefer dry sites with good protective ground cover. In stands where the burning of brush and other cleaning-up operations have been practised, little control of insects by mammals can be expected. The activity of small mammals in searching for sawfly cocoons is greatest in autumn when the mammal population is high and hoarding of cocoons is common.

45.3 : 13.2. WILKES, A. **Notes on the laboratory propagation of three European species of *Exenterus* (Ichneumonidae), parasitic on sawflies.** *Seventy-second Annu. rep. ent. Soc. Ontario, 1941* 1942 (41–4). [Dominion Parasite Laboratory, Belleville, Ontario.] I.I.E.

A brief account of the laboratory propagation of *Exenterus marginatorius* Fabr., *E. claripennis* Thom., and *E. abruptorius* Thb. The host larvae used in the experiments were the sawflies, *Neodiprion abietis*, *N. dubiosus*, *N. sertifer*, *N. lecontei*, *Diprion similis*, *Gilpinia hercyniae* and a Jack Pine sawfly (*Neodiprion* sp.) Oviposition and development of *E. marginatorius* and *E. claripennis* were successfully recorded, but as the parasite *E. abruptorius* was still in diapause no records could be made for this species. The propagation of all three species appears to be both practical and economical under laboratory conditions.

45.3 : 12.25 : 13.2. WILL, H. C. **Sawfly infestations in Pennsylvania.** *Proc. Pa. Acad. Sci.* 16, 1942 (47–51). L.S.

This note includes observations on *Neodiprion lecontei* which causes defoliation of Pines, particularly Scotch, Pitch, Austrian and White Pines.

45.3 : 60.3. CRAIGHEAD, F. C. **The influence of insects on the development of forest protection and forest management.** *Extr.* from *Rep. Smithsonian Inst. 1941* 1942 (367–92 + plates). [U.S. Bureau of Entomology and Plant Quarantine.]

A historical survey, with detailed bibliography, of forest-insect control in the United States during the past 40 years.

45.3 : 12.26–8 : 13.2. GORHAM, R. P. ***Rhamnus alnifolia* L'Her., a winter host of *Aphis abbreviata* Patch, one of the aphids feeding upon potato foliage.** *Canad. Ent.* 74, 1942 (96). I.I.E.

Plants of *Rhamnus alnifolia*, growing within 500 ft. of a large field of potatoes east of Grand Falls in Victoria County, Maine, were found, when examined late in September, to be heavily infested with aphids of the species *Aphis abbreviata* Patch, which had previously caused severe damage to the potato crop. In late October, from 10 to 35 eggs of the aphid were found beside each bud of *R. alnifolia*, and every bark crevice was filled with eggs. A survey of swamp areas on other farms in the district revealed that this shrub invariably bore large numbers of aphid eggs. *Rhamnus frangula* L. also was found to serve as a winter host.

45.3 : 12.25 : 13.2. : 56 : 11.11.4. BEAL, J. A. **Relation between tree growth and outbreaks of the Black Hills beetle.** *J. For.* 41, 1943 (359–66). [Duke School of Forestry, Durham, N.C.]

During the past decade a large number of serious and widespread outbreaks of the Black Hills beetle (*Dendroctonus ponderosae*) have resulted in heavy losses of Ponderosa Pine in the central Rocky Mountain region. In order to find out the effect of drought on the radial growth of the trees, and to determine the correlation that existed between growth rate and beetle epidemics, a study was made of increment cores from trees in 9 areas where outbreaks had occurred. Although most of the outbreaks took place during periods of deficient moisture and relatively poor tree growth, exceptions to this condition indicate that other factors may be as important in favouring the expansion of beetle populations to epidemic proportions.

45.3 : 07.7 : 13.2. UNITED STATES. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 60.

An autogiro was used successfully in treating 1,280 acres of woodland infested with the gypsy moth (*Porthetria dispar*). A combination of lead arsenate and atomized fish oil was used (p. 17).

45.3 : 12.25 : 13.2 : 24.3. UNITED STATES. **Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1942.** United States Department of Agriculture, Washington, D.C. 1942. pp. 60.

Pines in the forests of Oregon and California, which show high risk of beetle attack and are being removed in sanitation-salvage logging operations, generally yield a large percentage of the lower grades of lumber required at the present time. As a result of these operations a larger supply of high-grade lumber will be preserved in these forests than would be possible under regular methods of cutting. During 1942 sanitation-salvage sales amounting to about 30 million bd. ft. of high-risk trees were put into effect by the U.S. Forest Service in California (pp. 13–4).

45.3 : 12.26–8 : 13.2. CLARKE, J. F. G. **A new pest of *Albizzia* in the district of Columbia (Lepidoptera: Glyphipterygidae].** *Proc. U.S. nat. Mus.* 93, 1943 (205–8 + plates). O.R.S.

A new species, *Homaduala albizziae*, is described and figured; it was first discovered attacking the foliage and

flowers of *Albizzia julibrissin* Durazzini in the north-western part of the District of Columbia. More recent observations indicate an extension of its range north-eastwards into Takoma Park and Silver Spring, Maryland. The species appears to be exotic, and is becoming more abundant. No specimens have yet been recorded in Virginia.

45.3 : 12.26–8 : 13.2 (7). HARTZELL, A. **Biology of the Holly leaf miner.** *Contr. Boyce Thompson Inst.* 13, 1943 (17–27).

The Holly leaf miner (*Phytomyza ilicicola* Loew) confines its attacks chiefly to *Ilex opaca*, but it has also been reported occasionally on *I. cornuta*, *I. aquifolium*, *I. glabra* and *I. verticillata* var. *tenuifolia*. Notes are given on its distribution in North America, and on its appearance and life-history. The greatest damage to the host plant is caused by the larvae mining the leaves, but oviposition and feeding punctures also cause injury.

45.3 : 12.26–8 : 13.2. HARTZELL, A., COLLINS, D. L., and BLAUVELT, W. E. **Control of the Holly leaf miner.** *Contr. Boyce Thompson Inst.* 13, 1943 (29–33).

Three applications of nicotine sulphate and fish oil resulted in good control of *Phytomyza ilicicola* on *Ilex opaca*. Two applications might prove sufficient in a normal year if one were made 2 or 3 days before the peak emergence of the adult flies, and the other 2 or 3 days after the peak. Because of the difficulty of timing the spray, it is unlikely that a single spray would prove effective.

45.3 : 12.26–8 : 13.2. HODSON, A. C. **Biological notes on the Basswood leaf-miner, *Baliosus ruber* (Weber).** *J. econ. Ent.* 35, 1942 (570–3). R.A.E. A31 (196).

Leaves of Basswood (*Tilia americana*) are attacked throughout its range in North America by *B. ruber* in both the larval and adult stages. An outbreak of the insect has been almost continuous in part of Minnesota since 1935, and while many trees have been considerably weakened, few have died, even where feeding has been heaviest. This insect has also been recorded as a pest of Apple and Oak in the United States, but Oaks in a mixed stand containing infested Basswood were only very slightly damaged. An account is given of the feeding habits and life history of the insect, and the author discusses the relation between population density and degree of damage, and also the control given by undetermined Hymenoptera that parasitized 100, 98·8, 66·6 and 47·5 per cent. of the eggs in four localities in 1940. Basswood trees in a stand that had been treated with a spray of 2·5 lb. lead arsenate and 1 U.S. pint raw linseed oil per 100 U.S. gal. for the control of *Malacosoma disstria* were free from larval mines and showed only very light adult feeding, whereas damage was heavy in a neighbouring unsprayed stand.

45.3 : 12.11.1. PARR, T. **Voltage gradients in trees as an indicator of susceptibility to insect attack.** *J. For.* 41, 1943 (417–21). [Bureau of Entomology and Plant Quarantine, New Haven, Conn.].

Voltage gradients in trees may be used to determine their physiological condition and hence their susceptibility to insect attack. Field measurements with a portable vacuum-tube millivoltmeter [cf. *For. Abstr.* 5 (90)] have shown that in normal trees the voltage gradient is positive in the spring but becomes negative later in the summer. In trees which are subnormal, but with no external evidence of lowered vitality, the cycle is at least partially reversed.

45.3 : 12.25 : 13.2 : 23.24.2. JAMAICA. **Annual report of Forest Division, Department of Agriculture, for year ending March 31st, 1942.** (Abbreviated report). Department of Agriculture, Kingston, Jamaica, B.W.I. [1942?] Pp. 3 + tbls.

The planting of Cedar (*Cedrela odorata*) with banana shade appears to give considerable protection against the shoot borer (*Hypsipyla grandella*) (p. 1).

45.3 : 12.26–8 : 13.2. HARRISON, J. W. H. **The food-plants of *Aegeria crabroniformis* Lew. (Lep. Aegeriidae).** *Ent. Mon. Mag.* 79, 1943 (144).

In urban areas of Northumberland and Durham the 'lunar hornet' prefers to attach itself to Black Poplars, but in the country it is commonly found on *Salix caprea* L., and to a less extent on *S. aurita* L. It has also been recorded on *S. purpurea* L., *S. viminalis* L., *S. rubra* Huds. (= *S. viminalis* L. × *S. purpurea* L.), *S. atrocinerea* Brot. and the hybrid *S. aurita* L. × *S. repens* L.

45.3 : 12.25 : 13.2 : 13.15. TOOKE, F. G. C., and HUBBARD, C. S. **The Pine tree emperor moth, *Nudaurelia cytherea capensis*, Stoll. A survey and examination of the measures employed in its control.** *Sci. Bull. Dep. Agric. For. S. Afr.* No. 210, 1941. pp. 57 + plates. R.A.E. A31 (267–8).

An account of the bionomics of *Nudaurelia cytherea* F., subspecies *capensis*, Cram., all stages of which are described. The insect occurs in the Cape Province and has recently spread to Natal. It has become adapted to feeding on Pines, particularly *Pinus radiata* (*insignis*), on which it causes severe defoliation. Notes are given on the intensity of infestation and the extent of damage done by this insect in outbreaks that have occurred in South Africa since 1885.

The available control measures comprise hand-collection of all stages and the use of pigs to destroy the pupae. The first of these is ineffective and costly while the second has proved both cheap and effective. Comprehensive experiments, which are described in detail, showed that the pupae are not toxic to pigs in the field. Attempted control by means of calcium arsenate dust in 1934 was not successful, and the prospects of control by insecticides are poor, owing to the cost and the difficulty of application in the type of terrain in which most of the plantations occur. Of a number of stomach and contact poisons tested, natural and synthetic cryolite and a native ore consisting of almost pure calcium fluoride gave the most promising results. Derris and pyrethrum dusts were effective against larvae in the third instar, but not against the later stages. Calcium arsenate and lead arsenate seemed to be more effective at the rate of 30 lb. per acre than at higher and lower rates. The eggs are parasitised by three species of Hymenoptera and the larvae by the Braconid, *Apanteles maculitarsis* Cam., but the percentages destroyed are not great. Natural control is chiefly effected by a polyhedral wilt disease and another disease of which the causal organism is unknown, which together or separately cause high larval mortality, usually approaching 90 per cent. At one place, baboons have been stated to destroy considerable numbers of all stages. Outbreaks of this moth on native plants are usually controlled by natural factors after 2 or 3 years, but outbreaks lasting 8–10 years have been recorded in Pine plantations.

52. MEASUREMENT OF TREES AND TIMBER

52.1. *Diameter. Girth*

52.1 : 07.7. Le Sueur, A. D. C. **The R.A.C. quarter girth bar.** *Quart. J. For.* 37, 1943 (92–3).

The description of an instrument devised by the writer for the purpose of measuring mean quarter girth on standing timber. The instrument consists of a graduated cross bar mounted on a pole.

52.4. *Measurement of Volume*

52.42. Herrick, A. M. **How to measure trees.** *Ext. Bull. Purdue Univ.* No. 282, 1942. pp. [8]. [Purdue Agricultural Exp. Sta.]

This pamphlet indicates briefly the measurements and calculations required in determining the gross and net board-foot volume of standing trees.

52.42 : 12.25. Wellner, C. A., and Hansen, R. **Volume distribution in Ponderosa Pine trees.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 17, 1941. pp. 2.

The percentage distribution of gross merchantable volume by logs is tabulated for Ponderosa Pine trees containing two to eight 16-ft. logs per tree. Volumes are based on the Scribner Decimal C log rule.

52.43.2. Herrick, A. M. **How to measure logs.** *Ext. Bull. Purdue Univ.* No. 280, 1942. pp. 7. [Purdue Agricultural Exp. Sta.]

This pamphlet indicates briefly the method for determining the gross and net board-foot volume of logs. It includes the Doyle log rule.

52.43.2 : 01.7. Gevorkiantz, S. R., and Ochsner, H. E. **A method of sample scaling.** *J. For.* 41, 1943 (436–9).

A problem in connexion with the use of sample scaling is to determine the proportion of logs that should be scaled in order to obtain a good sample. This article gives formulas and tables for determining the size of sample necessary to attain any desired degree of accuracy when the total number of logs to be scaled and the variation of volume in individual logs are taken into consideration. The basic factors affecting the intensity of sampling P are:—(1) the total number of logs N involved, (2) the index of variability v of log volume, (3) the accuracy of sampling required e, and (4) the factor of safety t. The relationship between these factors is shown by the formula

$$P = \frac{1{,}000\ vt^2}{e^2N + 10\ vt^2},$$

in which N is given in units of 1,000 logs, and e and P are given directly in per cent.

52.43.2 : 01.7. Fogh, I. F. **Sampling methods in log scaling.** *For. Chron.* 19, 1943 (127–38). [Canadian International Paper Co., Three Rivers, Quebec.]

Studies by B. R. Lexen on the application of sampling methods in log scaling [cf. *For. Abstr.* 3 (259)] were extended to the scaling of Spruce and Balsam Fir bolts and small logs in Eastern Canadian pulpwood operations.

The three general methods of sampling that may be used—(1) random sampling, (2) representative or stratified random sampling, and (3) mechanical sampling—are described and compared as regards accuracy and work entailed. A random sampling of two per cent. provides a reasonably close estimate of the total but refinements in technique and intensification in sampling are necessary if great accuracy is desired. Three refinements in technique are outlined.

Mechanical sampling provides an unbiassed estimate of the mean, but evaluation of sampling error must be based on random samples. Due to ease of application in the field mechanical sampling should be used.

52.43.2 : 12.26–8. Gevorkiantz, S. R., and Zehngraff, P. **Scaling Aspen bolts by the cord.** *J. For.* 41, 1943 (450–2). [Lake States For. Exp. Sta.]

A short-cut method of scaling small, low-value logs requires scaling by the cord and the conversion of cords to bd. ft. using a table that gives the number of bd. ft. per cord for different numbers of 8-ft. bolts (with different average top diameters) per cord. To facilitate this practice, bolts can be graded by size classes, the grades being piled and scaled separately.

52.43.3 : 12.26–8 (54.3). Ram, B. S. **Standard and commercial volume tables for Teak (*Tectona grandis*, Linn. F.) in the Central Provinces.** *Indian For. Rec. (n.s.) Silviculture* 4-A (3), 1942 (pp. v + 145–69 + graphs). [Forest Research Institute, Dehra Dun.]

Volumes calculated by basal-area and quarter-girth measurements are given for various diameter and height, and girth and height classes. In addition, tables give the log outturn of trees of various diameter and height classes, sapwood percentages in the commercial bole of trees of various diameter and height classes, bark thickness and bark percentages in logs of various diameter classes, and bark percentages in the commercial bole of trees of various diameter and girth classes.

52.43.3 : 12.26–8 : 52.3. Zimmerle, H. Untersuchungsergebnisse bei der Schwarzerle. **[Results of investigations on European Black Alder.]** *Allg. Forst- u. Jagdztg.* 118, 1942 (299–308). [G.] [Württ. Forstl. Versuchsanst., Stuttgart.] Biol. Abstr. 17 (17200).

A volume table for *Alnus glutinosa* in Württemberg is presented, with tables showing the taper of Alder stems compared with those of Oak, Beech, and Ash. For 50–60 years Alder surpasses Beech in height and diameter and produces a greater volume of timber per ha., but it falls behind Site I Beech after about 60 years.

52.43.5 : 12.19.3 (78.7). Cain, S. A. **Sample-plot technique applied to Alpine vegetation in Wyoming.** *Repr.* from *Amer. J. Bot.* 30, 1943 (240–7).

A study of sample-plot technique with respect to the alpine fell-field vegetation of the Snowy Range of the Medicine Bow Mountains, Wyoming, led to the following conclusions:—(*a*) If a single sample plot is used, the minimum area for this community is about 32 sq. m. (*b*) When small, scattered plots are used the minimum size that will yield satisfactory data is about $\frac{1}{10}$ sq. m. (*c*) The minimum number of plots necessary to yield a representative floristic list appears to be small, but it is necessary to use at least 20 per stand in order to have satisfactory frequency percentages and coverage averages. Likewise, the more stands investigated the better the descriptive data obtained. *From author's summary.*

52.46. Krishnaswamy, K. **Valuation survey by 'spot method'.** *Indian For.* 69, 1943 (107–12).

The method, which is described in detail, was first employed for the sake of speed to replace the usual 'stripline method' in the forests of Bhadravati Division. It consists essentially in the enumeration of the growing stock in small circular areas (usually I chain in radius) distributed as evenly as possible over the forest. Stock-mapping may be undertaken simultaneously. The 'spot method' proved to be cheaper, more rapid, and also more accurate and simple in field practice than the 'stripline method'. Its main disadvantages are:—the large number of marginal trees, the inclusion or omission of which would affect the accuracy of the valuation figures; the necessity for having larger enumeration registers if each 'spot' is recorded separately; and the difficulty of applying the method in forests where the undergrowth is heavy.

53. SOLID CONTENTS OF STACKED MATERIALS. REDUCING FACTORS

53 : 33.4 : 33.51–2. WILSON, S. E. **Decimal scantling measurer and Petrograd standard calculator.** The Lumberbook Company, 8, Herbert Road, Clevedon, Somerset. 1943. pp. 32. [National Home Grown Timber Council.] P.R.

'This book provides tables for computing the cubic contents of any quantity of scantlings, battens, boards, sleepers, sawn pitwood, and dimension timber of any kind; also for reducing cubic feet to Petrograd standards and for finding the value at any price per standard.'

56. INCREMENT

56 : 22.89 : 12.25 : 21.6. ALLISON, J. H. **Forty years' growth of planted Pines in north central Minnesota.** *J. For.* 41, 1943 (449–50). [University of Minnesota.]

A report is given on the survival and growth of plantations of Red, White, Jack and Scotch Pine established in 1900 and 1901 on rather poor upland soils in north central Minnesota. The mean annual growth for Red Pine has been a little over 1 cord and that for White Pine about $\frac{2}{3}$ cord per acre. The Scotch Pine has been severely damaged by porcupines and sap-suckers and surviving trees have developed bad crooks. Jack Pine was heavily thinned by fire in 1905 and results indicate that this species should have at least 500 surviving trees per acre at 20 years in order to develop into a satisfactory stand.

56.02 : 01.4 : 07.7. DOUGLASS, A. E. **Advances in dendrochronology, 1943.** *Tree-Ring Bull.* 9, 1943 (18–24).

A general survey of work and publications on dendrochronology since 1937. Advances have been made in the choosing of suitable sites for obtaining good climatic records, particularly in arid regions such as the southwestern part of the United States. In response to a request by the Boulder Dam Management in 1941, investigations have been made on the history of the run-off of the Colorado River.

The findings in dendrochronology are now such that excellent ring records extend to a little before 250 A.D. Earlier records are less numerous, but several examples are quoted. A good Piñon log from Du Pont Cave, near Kanab, Utah, is reported to have been cut in 217 A.D., with a centre going back to about 90 A.D.

While most of the present records are from observations in the United States, recent work of importance has been done in Alaska, and it is hoped that data from the southern hemisphere, especially South America, may be secured.

For detecting 'cyclics' active at the present time a special instrument called a cycloscope is in use at the University of Arizona. The work of forecasting water-supply changes is an integral part of the investigations now in progress.

56.02 : 12.25. ORDING, A. Årringanalyser på gran og furu. [**Annual-ring analyses in Spruce and Pine.**] *Medd. norske Skogsforsøksv.* No. 25 [Vol. 7, No. 2], 1941 (1–354). [Nor.e.] N.D.A.

The subject is dealt with in considerable detail under the following headings:—(1) historical survey; (2) methods; (3) material investigated; (4) supplementary material from the annual-ring analyses by Aanstad; (5) on comparisons of growth curves from different tree species, and the connexion between variations in growth and climate; (6) on periodical variations and the possibility of establishing growth prognoses; (7) the forestal importance of the variations in growth climate; (8) annual-ring analyses and dendrochronology, subdivided as (*a*) methods and principles of dating, (*b*) on the significance in ocular cross-identifications, (*c*) critical analysis of a dating, (*d*) on requirements on future datings, and the establishment of standard scales.

56.2. MEYER, H. A. **Accuracy of growth prediction for short periods.** With comments by H. H. Chapman and W. H. Meyer. *J. For.* 41, 1943 (376–80). [Pennsylvania State College.]

It is suggested that use of the curvilinear method of forecasting diameter growth rate [cf. *For. Abstr.* 4 (258)] may decrease the accuracy of growth prediction 'due to the fact that the large variation in diameter increment from year to year and from period to period as a result of changing weather conditions is apt to produce spurious trends of diameter increment or to overshadow trends which may actually exist', and it is considered a safer procedure to determine future increment by the straight-line projection of past growth. In commenting on this note H. H. Chapman points out that the assumption of a straight-line relationship for all conditions ignores three fundamental laws of tree growth:—(1) As stands develop there is a reduction in diameter growth for all trees that cease to have room for unlimited expansion; (2) as basal area varies with the square of the diameter, volume increment will continue to increase for a time even after deceleration of diameter growth begins; (3) growth vigour falls off as maturity approaches. W. H. Meyer summarizes the case by stating that in estimating the future growth of most young stands some adjustment for deceleration must be made, whereas for old-growth stands a straight-line projection of past-growth is required as deceleration may be completely obscured by periodic variations.

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

57.0 : 12.19.2 : 22.88.1 (74.8) : 12.26–8. MEYER, H. A. **Structure and growth of a virgin upland Oak forest in southern Pennsylvania.** *Res. Pap. Pa. St. For. Sch.* No. 4, 1942. pp. 3 + tbls.

Data are given on the volume and structure, species and volume distribution by diameter classes, and diameter and volume increment for three small tracts of the virgin upland Oak type (principal species *Quercus montana*).

57.0 : 22.88.1 : 12.19.2. YOUORSKI, J., and MEYER, H. A. **Stand tables of virgin Beech–Birch–Maple–Hemlock forests.** *Res. Pap. Pa. St. For. Sch.* No. 3, 1942. pp. [27].

Tables showing species distribution, volume per acre, brief description of stand, etc., are given for a number of small stands of the virgin Beech/Birch/Maple Hemlock type.

6. MANAGEMENT. WORKING PLANS. SURVEYS

60. GENERAL LAND MANAGEMENT

60 (73) : 97.1 : 92. UNITED STATES. **Management and development of State and County land.** *County Planning Series U.S.D.A.* No. 13, 1941. pp. 9. [Bureau of Agricultural Economics.]

This leaflet discusses the growth of public interest in obtaining proper management and development of county- and state-owned land in the United States, and indicates some of the legislative measures that are being taken to promote better management practices.

60.3. *Management of Different Classes of Forest*

60.3 (77.5) : 97 : 91 : 4 : 23.2. **Forests and land use.** *Bull. Wis. Dep. Agric.* No. 229, 1942. pp. 56. [Division of Land Economic Inventory and Land Use, Wisconsin.]

This well-illustrated bulletin gives a brief, informative account of various aspects of forestry in relation to land-use planning and land management, with particular reference to conditions in Wisconsin. Subjects dealt with include a method of surveying and taking a land economic inventory, the important forest trees of the region and their associations, forest soils, yield, nursery practice and forest planting, insects and diseases of forest trees, timber estimating, fire protection, tree surgery, forestry in relation to agriculture and wild life, and land for recreation.

60.31 : 12.25 : 63 : 24.3 : 23.1 : 76.1. DAVIS, K. P. **Economic management of Western White Pine forests.** *Tech. Bull. U.S. Dep. Agric.* No. 830, 1942. pp. 77.

From a study in northern Idaho it is concluded *inter alia* that management plans for these forests should be based on 3 or 4 partial fellings, which lead to abundant reproduction; and that opportunities for private investment in the sustained management of these forests are slight, since such management allows of hardly any profit margin.

60.31 : 12.25 : 32.29.2 : 23.11. MCKINNON, F. S. **An outline of the minimum requirements for management of Douglas Fir.** *Res. Note B.C. For. Serv.* No. 10, 1943. pp. 4.

A brief outline is given of the main factors affecting the natural regeneration of Douglas Fir on the Lower Coast of British Columbia. These include (1) slash burning, and (2) a suitable source of seed supply. [Cf. *For. Abstr.* 4 (221).]

60.31.1 (79.7) : 4 : 8. MARCKWORTH, G. D. **Planning a forestry program for the State of Washington.** *J. For.* 41, 1943 (315–8). [University of Washington, Seattle, Wash.]

In December, 1941, a Forest Advisory Committee was appointed to prepare a comprehensive forestry programme for the State of Washington. This paper summarizes the recommendations of that committee on the major problems of forest practice, forest protection and administrative organization.

60.31.1 (71.1) : 66 : 23.1–2 : 43.1. TELFORD, R. C. **Forest management of the 'Coast Islands Working Circle'.** *For. Chron.* 19, 1943 (119–26). [British Columbia Forest Service, Vancouver.]

From present standards of utilization it is estimated that the annual production from the Coast forests of British Columbia will be 1,800 million bd. ft. from all productive areas, or 937 million bd. ft. from such areas as are at present accessible. The actual annual cut for the decade ending 1938 was 2,900 million bd. ft. In order to study the possibilities of and problems relating to a more intensive management and regulation of these forests, four of the small Provincial Forests located on islands north of Seymour Narrows have been grouped into an administrative unit to be managed as a working circle. The immediate objectives of management are:—(1) To regulate the cutting of Crown timber so that the total depletion from fires and logging is within the sustained-yield capacity. (2) In co-operation with timber operators, to study and develop cutting plans which will provide for natural regeneration following logging. (3) To conduct a progressive reforestation programme on the more valuable unstocked Crown areas. (4) To provide adequate fire protection and control measures.

The author discusses the general suitability of the selected area for the project and the information, relating to management possibilities, that has been obtained from studies so far undertaken. These studies indicate that a 100-year rotation will give the greatest return of marketable material, and that with a growing stock of 461 million bd. ft. of mature timber and 30 thousand acres of immature stands, the unit should provide an annual cut of 11 million bd. ft. for the first rotation. With the rearrangement of age classes and building up of growing stock the area will eventually produce 17,400 thousand bd. ft. per year.

60.31.2 (79.5 : 79.7). HAGENSTEIN, W. D. **The balance wheel of industrial forestry in the Douglas Fir region.** *For. Chron.* 19, 1943 (79–86). [West Coast Lumbermen's Association.]

The author discusses the progress being made by the forest industry in the northwestern States towards improved methods and practices in forest management and in timber utilization.

60.31.2 : 65.7 : 24.32 : 97.2. MITCHELL, H. C. **Regulation of farm woodlands by rule of thumb.** *J. For.* 41, 1943 (243–8). [Soil Conservation Service, Fort Worth, Texas.]

Two general rules are suggested to help the farmer in controlling his growing stock both as to quantity and distribution of size classes. These are:—(1) the spacing between trees, in feet, should be approximately the average d.b.h. in inches, plus 6; and (2) an average of one tree per acre per year should be harvested in addition to those removed by the 'D plus 6' rule. The basis for the rules, their effect on rotations and factors concerned in their application are discussed. In general it appears that their use for the regulation of

the growing stock would give reasonably satisfactory results.

60.31.2 (73) : 97.2. PRESTON, J. F. **The woodland management program of the Soil Conservation Service.** *J. For.* 41, 1943 (402–5). [Soil Conservation Service, Washington, D.C.]

The author outlines the work of technicians of the Soil Conservation Service in guiding woodland management activities of co-operating farmers. In general these activities include the selection of land suitable for permanent woodland development and the planning of a management programme for the area selected.

61. SURVEYING. MAPPING

61 : 11.62.1. OSBORN, B. **The photographic transect.** *Chron. bot.* 7, 1942 (262–3). [U.S. Soil Conservation Service, Jacksboro, Texas.] O.B.D.

In measuring the density of vegetation in order to determine its probable value in erosion control, it is less important to be able to distinguish species, or whether the plant material is living or dead, than to determine the continuity (or otherwise) of the cover. The photographic transect is a method proposed [cf. *Ecology* 21, 1940, (416–9)] for measuring the continuity and vertical depth of vegetation. Photographs are made of the vegetation from directly overhead and in vertical profile, a ruler being placed in a suitable position in relation to the vegetation. This method has been used successfully to measure the effect of grazing in plots on the Wichita Mountain Wildlife Refuge in Comanche County, Oklahoma.

61.31 : 07.7. PELLY, R. S. **Abney level surveys.** *Farm and Forest* 4, 1943 (85–7 + plate).

This paper describes a method of survey and of recording field notes when an Abney level fitted with a 'topographic' scale, and a steel topographic trailer-tape, a liquid compass and accessories are used. An advantage of the topographic-Abney method is that grade allowances are made directly on the trailer-tape without calculations or use of tables while horizonal distances are recorded.

61.32 : 52.46. SMITH, A. A. **Aerial photography and its use in timber inventories.** *Pulp Paper Mag. Can.* 44, 1943 (457–8). [From *Bull. Soc. canad. Photogram.* No. 1.]

A system of forest inventory that combines aerial photography with a ground cruise is described. The advantages of this system in comparison with a ground cruise alone are (1) increased accuracy of estimates and maps, and (2) lower costs.

65. DESCRIPTION OF GROWING STOCK

65.7 : 22.83.1 : 12.25. MULLOY, G. A. **A practical measure of stock density in White and Red Pine stands.** *For. Chron.* 19, 1943 (108–18). [Dominion Forest Service, Ottawa.]

It is pointed out that the determination of stand density by comparison of total basal area with that from normal yield tables is often impracticable and that an index of density is required that is independent of both age and site. Such an index has been developed by L. H. Reineke [cf. *J. agric. Res.* 46 (7), 1933] by plotting number of trees per acre (dependent variable) over average diameter (independent variable) on double-logarithmic paper. This gives a straight-line graph, the slope of which remains constant for all sites, age classes and most species. These findings are checked against records for 20 years of sample plot data for thinned and unthinned Red and White Pine stands. The author discusses the use of a stand density index based on this principle in relation to thinning technique and stand improvement cutting. In practice it is necessary merely to estimate the average diameter of the stand and the spacing for optimum development is then determined.

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

90 (66.9) : 96.1 : 91. **'There is forestry. . . .'** *Farm and Forest* 4, 1943 (53–61).

The aims and activities, in general, of the Forest Department of Nigeria are stated as follows:—

'(1) To protect, preserve and where necessary re-establish the tree and vegetal cover essential as an insurance against deterioration of soil, water supplies and climate, and thus to maintain and improve the conditions of life and environment of the people of Nigeria.

'(2) To develop and maintain the productive capacity of the forests so as to ensure the adequate and permanent supply of the numerous and varied forest products necessary for the maintenance and improvement of the standard of living of the people of Nigeria, and promote external trade in timber and other forest products that are surplus to domestic requirements.'

The measures being taken to implement this policy and some of the problems involved are discussed briefly in this paper.

90 (42.1–8). COTTERELL, Sir R. **Post-war forest policy.** *Quart. J. For.* 37, 1943 (68–80).

The forest policy which the author outlines for Britain would involve the setting up of semi-public county committees to supervise and assist private forestry. These committees would operate under the Ministry of Agriculture. State forests would be administered under a separate Government department.

90 (71.1) : 66 : 97.4 : 81 : 85. TURNER, H. **More vigorous forest policy proposed by interior operator.** *B.C.Lumberm.* 27 (6), 1943 (29–30, 48, 50, 52, 54).

The author discusses some of the problems that have arisen in connexion with the past forest policy in British Columbia, and makes proposals for a planned forest policy along the following lines:—(*a*) A far-reaching policy of sustained yield. (*b*) Control of timber for established industry. (*c*) A far bigger forestry department. (*d*) For some years to come at least, the turning back to the forestry department of all the revenues that rightfully belong to it, so that an organization can be built up in forestry to deal adequately with the problems involved.

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

91.1 (410) : 94. GREAT BRITAIN. **Nature conservation in Great Britain.—Report by the Nature Reserves**

Investigation Committee. *Mem. Nat. Reserves Investig. Comm.* No. 3, 1943. pp. vi + 25.

A report by the Nature Reserves Investigation Committee on the general principles which in the opinion of the Committee should govern the selection, acquisition, control and management of nature reserves and such other areas in Great Britain which should, it is considered, be brought under some form of control in order to conserve the flora and fauna of the country for the following purposes:—(*a*) scientific and economic studies, (*b*) enjoyment of nature by the public, and (*c*) education in natural history.

91.1 : 76.1. Cox, L. D., and Owens, R. E. **Maintenance costs of state parks and similar scenic areas.** *Bull. N.Y. St. Coll. For.* No. 23, 1942. pp. 43.

Data collected as part of a wider investigation on park management costs in the northeastern and north-central United States.

91.1 (66.4) : 97.2 : 96.1. Maughan-Brown, H. **The Sei Bush belts of Sierra Leone.** *Farm and Forest* 4, 1943 (8–9).

In the south-western region of Sierra Leone, where vegetation degradation is extensive and land hunger is acute, the native practice of leaving a strip of high bush ('Sei' bush) alongside paths, roads and rivers when 'brushing' the farms has been adapted for the purpose of forest reservation, the work being carried on through the Native Administrations. The reserved strips are normally 200 ft. on either side of the track and are to be used for productive as well as protective purposes. They consist mainly of secondary growth and are well suited for line planting. Species selected for this purpose include *Sarcocephalus diderrichii*, *Tarrietia utilis*, *Terminalia ivorensis*, and *Afzelia africana*.

91.3. *Influence of the Forest on the Environment*

91.3 : 11.41.1 : 11.11.2 : 11.62.3 : 12.19.2. Belotelkin, K. T. **Soil-freezing and forest-cover.**—With discussion. *Trans. Amer. geophys. Union 1941.* Part I–B, 1941 (173–5). [Northeastern Forest Exp. Sta. New Haven, Conn.] L.S.

The relationship of soil-freezing to forest cover was studied on plots of various types—Spruce flat, Spruce swamp, Fir flat, a northern hardwood stand, and an open field. It was found that forest cover had a favourable effect on early winter floods owing largely to delay in ground freezing and to the type of freezing that occurred. Depth and time of soil-freezing and rapidity of thawing varied with the type of forest cover. Frost penetration was least in the hardwood plot and greatest in the Spruce swamp. Thawing began and was completed earliest in the hardwood plot. The open field ranked second in this respect, and the Spruce swamp last. On fine-textured or poorly-drained soils frost penetration was deeper than in coarse-textured or better-drained soils.

91.3 : 11.41.5–6 : 11.62.22 : 12.19.4. Alderfer, R. B., and Bramble, W. C. **The effect of plant succession on infiltration of rainfall into Gilpin soil in central Pennsylvania.** *Res. Pap. Pa. St. For. Sch.* No. 5, 1942. pp. 13.

A study was undertaken to determine the effect on rain-water infiltration and run-off of the soil structure and natural vegetation at the more prominent stages of upland plant succession on abandoned farmland areas, including erosion pavement, old abandoned field and pasture, Virginia Pine forest, and Oak/Hickory forest conditions. All experimental plots were located on the same soil type, on very much the same aspect and on slopes varying from 18 to 27 per cent. Infiltration capacity and run-off were determined by means of a type-F infiltrometer, artificial rainfall being applied at intensities of 1·5 and 3 in. per hour.

The Oak/Hickory forest was the most effective in maintaining the highest infiltration capacity, degree of structural development, organic matter content, and porosity: no run-off occurred under either rainfall intensity. In the Virginia Pine forest 3 to 4·5 per cent. of the rainfall at 1½ in. per hour and 1 to 16·5 per cent. of that at 3 in. per hour intensity was lost as run-off. On old poverty-oat-grass pasture and old field loss as run-off amounted to 43 and 51 per cent., respectively, of rainfall of both intensities. Erosion pavement consisting of an undisturbed surface accumulation of small shale fragments showed a surprisingly high infiltration capacity, only 4 to 6 per cent. of the rainfall being lost as run-off.

92. FOREST LAW

92 (729.2) : 12.14.8 : 12.26–8. Jamaica. **Annual report of Forest Division, Department of Agriculture, for year ending March 31st, 1942.** (Abbreviated report.) Department of Agriculture, Kingston, Jamaica, B.W.I. [1942?] Pp. 3 + tbls.

A law was passed in 1942 prohibiting all sale of the bark of Mahoe (*Hibiscus elatus*), Dogwood (*Icthyomethia piscipula*) and Mahogany (*Swietenia mahagoni*) (p. 1).

92 (79.5). **Oregon's new forestry laws summarized.** *W. Cst. Lumberm.* 70 (6), 1943 (63, 93).

A summary is given of the forestry legislation enacted in the State of Oregon during 1943.

94. FOREST OWNERSHIP

94 (73) : 91.1. Eldridge, S., and Associates. **Development of collective enterprise. Dynamics of an emergent economy.** University of Kansas Press, Lawrence, Kansas. 1943. pp. 577. I.F.B.

This book is a survey and analysis of branches of economic and social activity in the U.S.A. that are collectivized (protection of persons and property, postal services, education and research, etc.) or are undergoing collectivization (forestry, housing, credit and banking, etc.). It is the outcome of 5 years of research by a group of 30 collaborators whose general objectives were:—(1) to determine, through inductive study, the basic factors in the growth of collective undertakings, and (2) to provide an exposition of these undertakings as going concerns.

The chapter on forestry (pp. 211–26) has been prepared by John Ise, Professor of Economics at the University of Kansas and author of 'The United States Forest Policy' (New Haven, 1920). It provides a concise survey of the history of the forest conservation movement and, in particular, of forest reservation and the activities of the U.S. Forest Service. Energetic leadership is placed among the outstanding factors in the reservation movement. In reply to the question: what are the forces that brought about socialization of some of the timber lands?—socialization, in this case, meaning usually the setting aside for special treatment of what was already public property—Ise states:—'It is clear that consumer interest acts in a peculiar

way in its influence on the socialization of natural resources, to the extent that it is really an influence. For the short run, consumer interest should logically be hostile to conservation and therefore to the reservation policy, because the reservation policy is certain to bring less rapid exploitation and therefore higher prices of lumber, immediately, than private ownership and exploitation. The consumer interest must be farsighted, looking beyond immediate wants and well into the future if it is to be favorable to conservation; and there is no doubt that to some extent it has become so. The warnings of conservationists have had some influence, particularly in the East, where the timber has been cut, and in the prairie States, where there never was much timber. Yet . . . the interests of consumers would not have been strong enough to overcome the economic and political power of producing interests, until the timber was practically gone, or in private hands. Indeed, this was not far from the actual situation, for the vast bulk of the valuable timber was in private hands before the reserves were created. The fact that they were created before *all* the valuable timber was in private hands must be attributed largely to the influence of a few men, acting individually and through associations.'

'The passage of the Forest Reserve Act itself was due not to general public interest, but to the efforts of one man—probably Secretary Noble, of the Department of Interior—favoured by a combination of peculiar circumstances; and most of the forest reserves—approximately two-thirds of them—must be credited to Gifford Pinchot and President Theodore Roosevelt, with Pinchot as the moving spirit behind the President, devoting his time, energy and fortune to the promotion of the cause of conservation.'

'Once the reservation policy had been established, once the reserves had been set aside as the property of all the people, many people turned to a favourable attitude who had formerly been indifferent or hostile—a common shift in the public attitude toward socialized resources, industries and activities.. It appears that many people are intellectually incapable of appraising a hypothetical scheme, that they cannot easily appraise an order of things which they do not see actually before them; and that therefore they are likely to be indifferent or hostile to any such thing—the forest reserves, for instance, before they were actually established.'

The problem of public *versus* private ownership and management is a familiar one in forestry. The book under review provides a source of reference for those who wish to compare forestry with other spheres of economic activity from the point of view of collectivization, and its relevance is by no means confined to the United States.

94.12 (74.8–75.5). **Community forests in the Allegheny region. Report of Committee on Community Forests, Allegheny Section, Society of American Foresters.** *J. For.* 41, 1943 (332–4).

Community forests are defined by the committee as including all areas of actual or potential woodland owned by any public agency except the federal or state government. The extent and objectives of such forests in the region covered by the Allegheny Section are discussed and recommendations are made for the development of community forests in that region.

94.6 (73) : 95.1. **Rural tax-delinquent lands.** *County Planning Series U.S.D.A.* No. 12, 1941. pp. 6. [Bureau of Agricultural Economics.]

This leaflet discusses some of the major problems arising in rural areas in the United States in connexion with tax-delinquent land, and outlines possible improvements in State laws which would aid in relieving the problems.

95. FOREST TAXATION

95.1 (73). BRIGGS, C. W. **A timber tax reform program.** *Sth. Lumberm.* 166 (2092), 1943 (32).

A committee was appointed by the Board of Directors of the National Lumber Manufacturers' Association in the fall of 1942 to investigate the timber tax problem in the United States. The present paper outlines the plans that have been put before the committee and discusses briefly the solution of the tax problem that is under consideration.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97 (73) : 98.1 : 94 : 07.2. GRAVES, H. S. **Some post-war problems in forestry,** *J. For.* 41, 1943 (319–23).

The author emphasizes the basic importance of forests and other natural resources in the post-war economy of the United States, and predicts a continuing large demand for forest products. The importance of securing information on the condition of local forests in all parts of the country and of investigating problems of forest ownership is indicated, and stress is laid on the need for stabilization of the forest resource and of the industries dependent on it.

97.1 (54.9) : 96.3. FURER-HAIMENDORF, C. VON. **The problem of shifting cultivation in Hyderabad State.** *Extr.* from *Hyderabad For. Mag.* Oct., 1942. *Indian For.* 69, 1943 (128–35).

Shifting cultivation in India, known by such local terms as *podu*, *bewar* and *jhum*, although practised by a great part of the aboriginal population from times immemorial until the end of the last century, has not resulted in the serious forest deterioration that might have been expected and cannot be regarded as an 'unmitigated evil'. A description is given of the methods employed by the Hill or Konda Reddis, a representative tribe of aboriginals who for generations have practised the shifting cultivation of hillslopes and who inhabit the rugged mountain ranges of the Eastern Ghats on both sides of the Godavari gorge in Hyderabad State and the Madras Presidency. The right of these people to earn their livelihood in this traditional manner has been recognized both in Hyderabad and the Madras Presidency. The position of the Kolams and Naikpods in the Adilabad District is, however, less favourable, as most of their lands have been incorporated in forest reserves where *podu* cultivation is virtually illegal. Only the slopes actually under cultivation at the time of demarcation were set aside for the use of the aboriginals, with the result that it is no longer possible for them to follow their traditional short-term rotations and the overworked soil is becoming increasingly impoverished and has ceased to yield adequate crops. No signs of deforestation or soil erosion were visible under the system of shifting cultivation as practised in the past by the Reddis, Kolams, and Naikpods because as soon as signs of soil exhaustion

began to appear the *podu*-cultivators moved on while the soil was still sufficiently fertile for the growth of trees, and natural regeneration kept pace with their periodic fellings. If, however, the area available for shifting cultivation is so restricted that it becomes necessary to prolong the period of cultivation, natural regeneration will not occur on the exhausted soil, and the area will then be open to erosion.

Although shifting cultivation is often regarded as a wasteful form of agriculture, it must be remembered that the aboriginals find thereby a livelihood in areas where no other form of cultivation is possible and where no other population could exist. Moreover, from the point of view of forest exploitation, the presence of aboriginals in these remote parts guarantees a permanent supply of labour. It is suggested that some system, such as the Burmese *taungya* system, might be adopted, whereby forest trees must be replanted on abandoned fields. Where forest exploitation is already taking place the *podu*-cultivators could be allowed to cultivate the clearings for one or two years after the removal of timber of commercial value without much harm resulting, and areas where growth is too inferior or too difficult of access for profitable exploitation could also be set aside for *podu*-cultivation.

97.1 (66.9) : 23.21. ABRAHAM, J. M. O. **Land utilization near towns.** *Farm and Forest* 4, 1943 (98–100).

The advantages of growing suitable trees on unoccupied land within towns and villages in parts of Nigeria are discussed. The two main factors to be considered would be soil quality and the possibility of encouraging the tsetse fly. It is suggested that the careful selection of tree species would solve both of these problems.

97.1 (71.1). SPILLSBURY, R. H. **Land utilization on Vancouver Island.** *B.C. Lumberm.* 27 (6), 1943 (27–8, 113–4, 116, 118). [B.C. Forest Service.]

While the mineral, fishery and forest industries of British Columbia are dependent on foreign markets, agricultural production is limited to domestic markets which are based largely on the prosperity of the forest industry. Climatic and geographical conditions on Vancouver Island are particularly favourable for the growing and manufacture of forest products for world markets. Future planning therefore should require the use of all non-agricultural land for the growing of productive forest and the greater industrial utilization of forest products. Eventually this would result in the expansion of the agricultural market.

97.1 (74.7). DARRAH, L. B. **An economic study of land utilization in Schuyler County, New York.** *Bull. Cornell agric. Exp. Sta.* No. 781, 1942. pp. 40 + map.

97.1–2 (71.21) : 11.49.3. MITCHELL, J., and MOSS, H. C. **Problems of land settlement in Saskatchewan.** *Sci. Agric.* 23, 1942 (195–9). [University of Saskatchewan, Saskatoon, Saskatchewan.] E.M.B.

While 50 per cent. of the prairie area of Saskatchewan can be cultivated, it is doubtful if 10 per cent. of the grey wooded soils of the Province would be fit for this purpose. Not only are the latter much lower in natural fertility, but they are more difficult to bring into good, friable physical condition; moreover, a proportion of the wooded soils is likely to be peaty. Clearing and cultivating this type of soil is slow and the cost may be high. Agricultural settlement should be based on the conservation of natural resources—it would be false economy to destroy thousands of acres of timber in order to bring a few acres of land under cultivation.

97.2 (74.2) : 76.2. CHANDLER, J. M. **The place of woodland in the farm organization in Coos County, New Hampshire.** *Bull. N.H agric. Exp. Sta.* No. 337, 1942. pp. 34. [U.S. Bureau of Agricultural Economics.]

The writer discusses means whereby the net cash income of the farms could be increased by making better use of the forests.

97.2 (77.4–7) : 09.4 : 98.1 : 60.31.2. ZON, R., and DUERR, W. A. **Farm forestry in the Lake States: an economic problem.** *Circ. U.S. Dep. Agric.* No. 661, 1942. pp. 33. [Lake States For. Exp. Sta.].

Farm woods contribute more than half of all the timber cut annually in the Lake States—835 million bd. ft. and 7·8 million cords, and they supply nearly one-fourth of the raw materials used by the forest industries of the region—488 million bd. ft. and 92,000 cords annually.

The value of the timber cut on farms amounts to about $44,000,000 per year, an average of $96 per wooded farm or $2·92 per acre of woodland. The present low returns are due to improper utilization and marketing of timber and to the depleted condition of timber stands, resulting largely from grazing and overcutting.

Well-managed farm woodlands in the Lake States are capable of yielding annual returns of $5 or more per acre. Where co-operative timber management and marketing are economically feasible, they can often increase the prices obtained for woods' products by 25–50 per cent.

Although attention to farm forestry as a part of agricultural programmes has increased in recent years, there is need for additional public effort, viz: (1) Education of woodland owners and technical assistance to promote better farm-forestry practice; (2) better utilization and marketing, especially through farmers' co-operative efforts; (3) some measure of public control over timberlands to prevent devastation and to keep the lands reasonably productive; (4) farm-forest research to provide basic facts. *From authors' summary.*

97.4 : 12.26–8 (54.87). **Ceylon Balsa—beginnings of a new industry.** *Timb. Tr. J.* 166, 1943 (164).

The increased use of Balsa (*Ochroma* sp.) in aeroplane manufacture is stimulating production in Ceylon.

98. THE TIMBER MARKET

98.1 : 91.1 (73). CHAPMAN, H. H. **The war and the parks.** *Timberman* 44 (8), 1942–43 (15–6, 31).

The national parks of the United States (including Alaska) have a total area of 21,600,000 acres. The natural resources within these parks are protected against all forms of exploitation. The importance of maintaining this policy is emphasized but it is pointed out that if the parks are extended beyond reasonable limits there may be a tendency towards the breaking down of safeguards against commercial use when economic requirements become critical. With the creation of the Olympic National Park in 1938 and its extension in 1940 a total volume of 751 million bd. ft. of virgin Sitka Spruce of prime quality has been reserved from exploitation as long as it remains within the park. At the same time the present increased demand for

high quality timber has made necessary the shipment of Sitka Spruce logs from Alaska and the use of a number of substitute woods. The economic needs of the country, for both peace and war, should be considered before attempting any further extension of the national parks.

98.1 (73). CLINE, A. C. **Lumber and the war.** *J. For.* 41, 1943 (324–8). [War Production Board, Washington.]

This paper emphasizes the basic importance of forest products in the war and outlines the efforts being made by the U.S. War Production Board and the U.S. Forest Service to assist industry in meeting essential military and civilian needs. Stress is also laid on the relative scarcity of accessible high-quality timber, particularly in hardwoods, and on the necessity for practising forestry as the only means of assuring adequate future supplies.

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